ENERGISE

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

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# Deliverable 3.1

## Good practice report: capturing cross-cultural interventions

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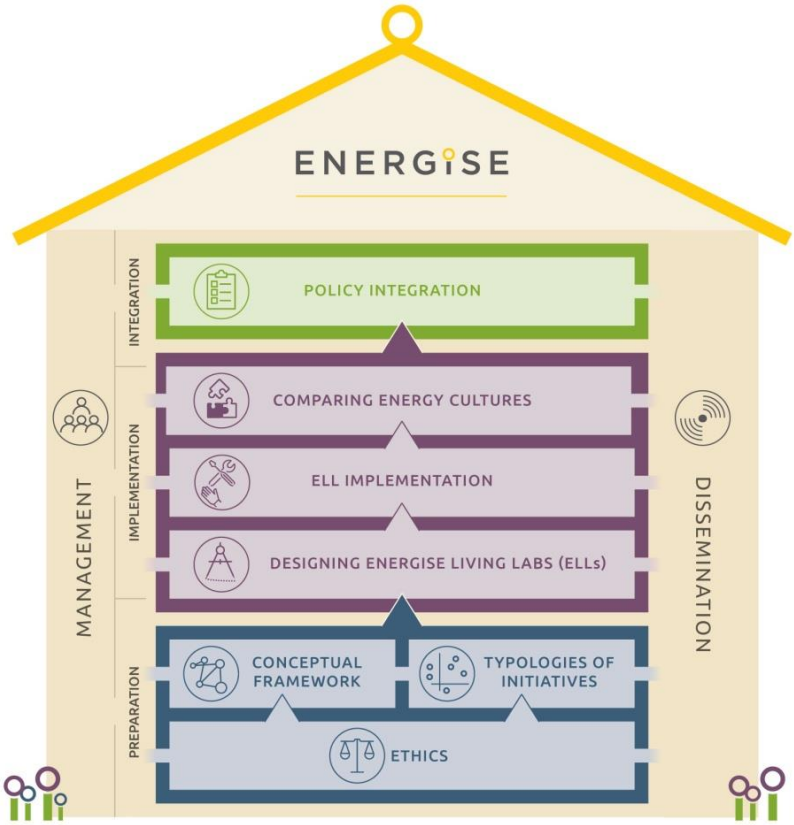
# ENERGISE PROJECT

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 energy cultures.
- **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

Opportunities for households to change their energy use vary significantly across Europe as well as within European countries. These differences are illustrated with examples from four domains of household energy use: home heating, domestic hot water usage, appliance usage and lighting, and daily mobility. We review practices within these domains on the basis of material and institutional conditions and socially shared conventions steering energy use. We also review existing evidence on interventions effectiveness and context dependence of interventions that aim to change household practices. Our findings show how different the conditions surrounding European households are. Considering the prospects for cross-cultural interventions, it is important to understand how intervention effectiveness depends on context (such as the local practice cultures). Material, institutional and social aspects of various kinds of energy related practices play a large role in terms of whether and how people can 'act' on proposed interventions.

On the basis of these findings, as well as the database on sustainable energy consumption initiatives, descriptions on national contexts, and methods to uncover researchers' and practitioners' views on the role of contexts and change mechanisms in these initiatives, we identified five categories of initiatives which are likely to work across Europe: (1) needs-based tailored support; (2) pioneers; (3) challenges, games and competitions; (4) peer-to-peer; and (5) learning by doing.

From the perspective of environmentally relevant household practices, it would be important to target issues that really make a difference in household energy use, i.e. the most energy intensive practices. Ideally, change initiatives should target several aspects of household energy use and several dimensions of practice cultures, thus allowing better understanding of the interconnections between practices. There is individual variation in performing practices, but at the same time practices are socially reproduced and guided by understandings and assumptions of normality and acceptability in a given context. Our expert-based analysis of the theories of change underlying selected change initiatives served to uncover different ways in which European initiatives can work to change engrained practice cultures. We found that interventions in practice need to consider to what extent they want to support existing practice by adapting new solutions as closely as possible to the practices, and to what extent they want to challenge them.

More research is required to discover how packages of measures and contextual conditions might support a shift toward not only energy efficiency, but also sufficiency. Our expert-based analysis also rendered a number of suggestions for how to improve on our existing examples of cross-cultural interventions, such as pioneering practices and learning by undoing. These ideas hold significant potential for sustainable energy use, yet require more research into possible details of implementation. This document will further guide work in designing two ENERGISE Living Labs to reduce household energy use. These designs will recognise the diversity of energy related practice cultures and aim to work with a variety of routines and ruptures that influence household energy demand in Europe.

# 1 INTRODUCTION

Households use energy to heat their homes, to acquire, store and prepare food, to wash clothes and take showers, and to watch television and relax – among other mundane things. However, there is ample evidence that the ways in which households are engaged in these mundane practices and their energy intensities vary greatly across Europe and within European countries. Similarly, it has been shown that the effectiveness of initiatives to save energy[1] also vary both between and within countries. While there have been several successful European projects that have rolled out similar measures in several countries, there is some evidence of variable outcomes depending on geographical, institutional and socio-demographic context.

ENERGISE Work Package 3 leads the design of ENERGISE Living Labs (ELLs). The objectives of WP3 are to

- **identify interventions** that work across energy cultures and diverse infrastructures, considering differences in metering and billing practices, housing stock, socio-economic and cultural conditions in EU Member States,
- **design two types of ENERGISE Living Labs** that work across diverse energy cultures and engage various hard-to-reach households and communities,
- **select sites and target groups** for the ENERGISE Living Labs that allow for widespread and rapid upscaling of the interventions in the participating countries and beyond, and
- **define indicators of success** and related quantitative and qualitative measures, including baseline analysis, and methods for assessing rebound and spinoff effects.

WP2 systematically identifies, examines and classifies 1,000+ case studies of sustainable energy consumption initiatives from 30 European countries (EU-28, Switzerland and Norway). WP3 will translate these findings into designs for innovative, readily replicable and scalable Living Labs (implemented in WP4) and provide guidelines for practitioners. An especially developed sustainability assessment toolkit (SAT) will measure ELL outcomes (in WP4) and deliver data for comparative analyses of energy practices and cultures (in WP5).

The aim of this document (D3.1) is to identify **which kinds of interventions in energy using household practices might work in several European countries and sub-national contexts, given the large differences between and within countries in energy-**

[1] The title of this deliverable includes the term 'interventions' and the term is used selectively in the text as well. "Intervention" is an admittedly modernist term, referring to "an organized, planned and usually ongoing effort designed to ameliorate a social problem or improve social conditions" (Rossi et al. 1999: 2). The term is commonly used when speaking of various ways to influence household energy use, such as feedback, goal-setting, commitment or modelling (Abrahamse et al. 2005), and it is also included in the title of the Spurling et al.'s (2013) paper *Interventions in practice: Reframing policy approaches to consumer behaviour*. The term can in some cases be understood as downplaying householders' active role in changing energy use, and as viewing households as passive objects of interventions. We recognise and wish to avoid such connotations: our usage of the term, instead, refers more to the notion of interventions (not in households but) in household practices that have implications for energy use.

**relevant practice cultures.** By context, we mean not only geographical or institutional locations (such as particular countries) but also sets of social rules, norms and relationships (Pawson & Tilley 1997). However, for ENERGISE, the aim is to find out if there are change initiatives that could work across several European countries.

To this end, the document provides a good practice report capturing interventions identified on the basis of meta-studies, practice-based interventions, examples from the ENERGISE database of European sustainable energy consumption initiatives, and feedback from the expert panel including practitioners and academics across Europe. In order to identify change initiatives that stand a good chance of working across European country contexts, and are hence viable for further testing in the ENERGISE Living Labs, this report investigates:

- prior research on reasons for variations in several energy-related practices (related to domains of home heating, domestic hot water use, lighting and use of appliances, and mobility),
- previous research on the influence of material, institutional, social and organisational aspects of the effectiveness of energy saving interventions,
- theoretical and methodological approaches to uncover the role of these aspects in interventions, and
- based on the ENERGISE database of European sustainable energy consumption initiatives, an analysis drawing on experienced researchers' and practitioners' theories of change to identify interventions or initiatives that are likely to work across a wide range of contexts.

We use these diverse sources to arrive at

- aspects we identify as cross-culturally appropriate in terms of changing domestic practices related to energy use,
- aspects of change initiatives that are likely to be highly context-dependent, making them very effective in their respective locations but also hampering their successful transfer across cultural or national boundaries, as well as
- aspects that require more research with respect to their context-dependence.

This document will further guide work in designing two ENERGISE Living Labs to reduce household energy use: one that involves elements of community action and engagement and one that focuses strongly on changing individual households' engagement in energy-relevant practices. These designs recognise the diversity of energy cultures and aim to work with a variety of routines and ruptures that influence household energy demand in Europe.

# 2 DIVERSE PRACTICE CULTURES INFLUENCING ENERGY USE IN EUROPE

Opportunities for households to change their energy use vary significantly across Europe as well as within European countries – for example, among urban and rural dwellers, wealthy or poor households, and according to dwelling type and tenure. In this chapter, these differences are illustrated with examples from four domains of household energy use: home heating, domestic hot water usage, appliance usage and lighting, and daily mobility. Each category is treated separately, even though it is clear that both material conditions and interconnected occupant practices influence energy use in the home (Gram-Hanssen 2011). Recognising the diversity of practices that contribute to domestic energy use, including variations in their (in)visibility and (in)conspicuousness, ENERGISE focuses its empirical part primarily (but not exclusively) on practices that require direct energy use (Rau & Grealis 2017: 19). Thus, in the following review, we are excluding domains such as food consumption, leisure activities and tourism.

This chapter zooms in on elements of energy use across Europe that are directly related to domestic practices or daily mobility that connects the household to other sites. We draw on the ENERGISE conceptual framework (Rau & Grealis 2017) to investigate separately (where possible) the following elements of energy-relevant practices: (1) material conditions, (2) attitudes, perceptions and social norms and (3) actual energy use. Where possible, we offer evidence of households' opportunities both in terms of investments (renovation, purchase of equipment) and mundane practices related to, for instance, comfort (in terms of indoor temperatures, showering, lighting, and mobility). Additionally, since in many cases (especially in the built environment) material conditions are closely tied in with formal, normative and cultural institutional rules and conditions (such as ownership patterns and governance rules, professional mandates and conventions), we consider institutional conditions in conjunction with the material ones. Broader institutional influences on practice cultures and related forms of energy use, such as those connected to national policies, energy endowments and prices, and historical developments, are discussed elsewhere (e.g. Genus 2012; Heiskanen and Matschoss 2016; Heiskanen et al. 2008).

## 2.1 HOME HEATING

Home heating has large implications for household energy use, and indeed total energy use in Europe. On average, practices related to heating, cooling and domestic hot water constitute 85%, and heating alone about 78%, of household energy usage in Europe (EC 2016). Yet there is significant variance across countries (Figure 1), which is due to climate conditions but also due to a variety of other material, institutional and social factors – as can be seen in the case of the three highest users in Figure 1: Finland (average annual temperature 2°C), Austria (6°C) and Belgium (10°C).

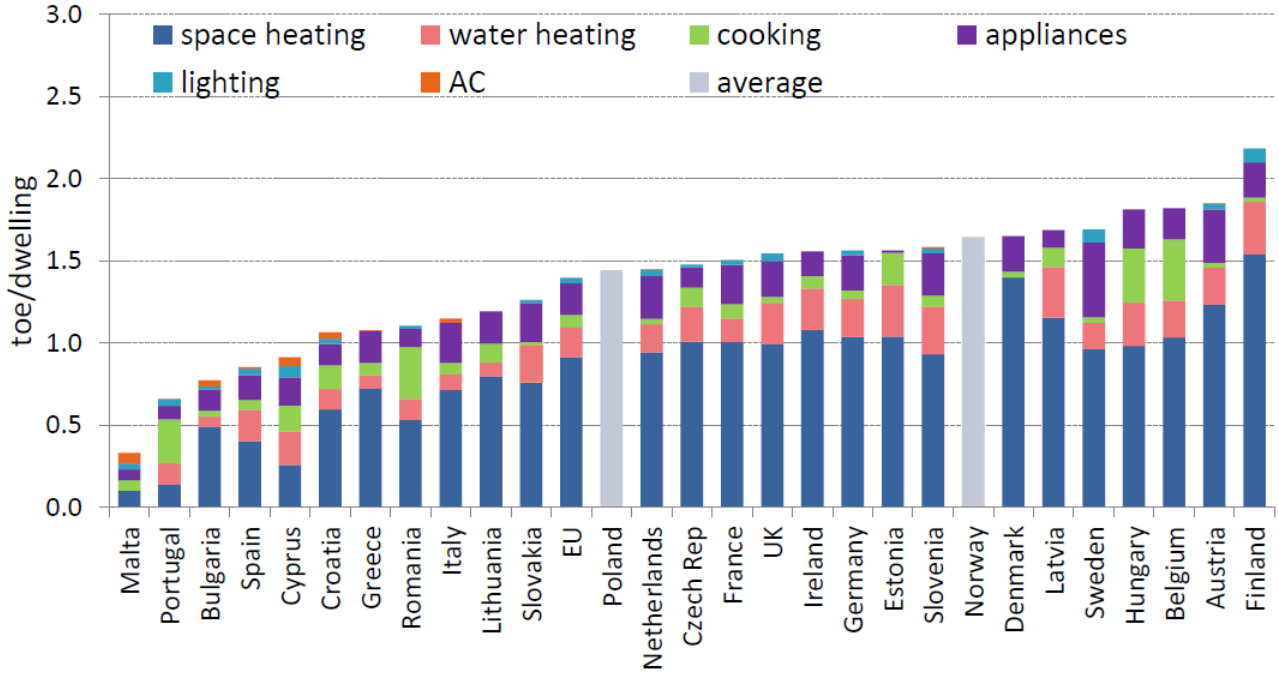



*Figure 1. Household energy consumption by end-use, tonnes of oil equivalent (toe), 2012 (Odyssee 2015).*

**Material conditions,** such as type of the dwelling, both enable and constrain householders' ability to influence their home heating practices and associated benefits – at least to some extent (see Gram-Hanssen 2017). Moreover, opportunities for reducing energy use for heating also depend on the size of dwellings, as well as on their physical layout, such as numbers and sizes of rooms (e.g. Salat 2009). There are great differences among European countries in this respect, as shown in Figure 2, with average dwelling size ranging from about 60 $m^2$ in Estonia, Latvia and Romania to more than 100 $m^2$ in Portugal, Denmark, Ireland and Cyprus. Larger dwellings consume more energy, but multiple rooms offer the opportunity for regulating temperatures when rooms are not used.

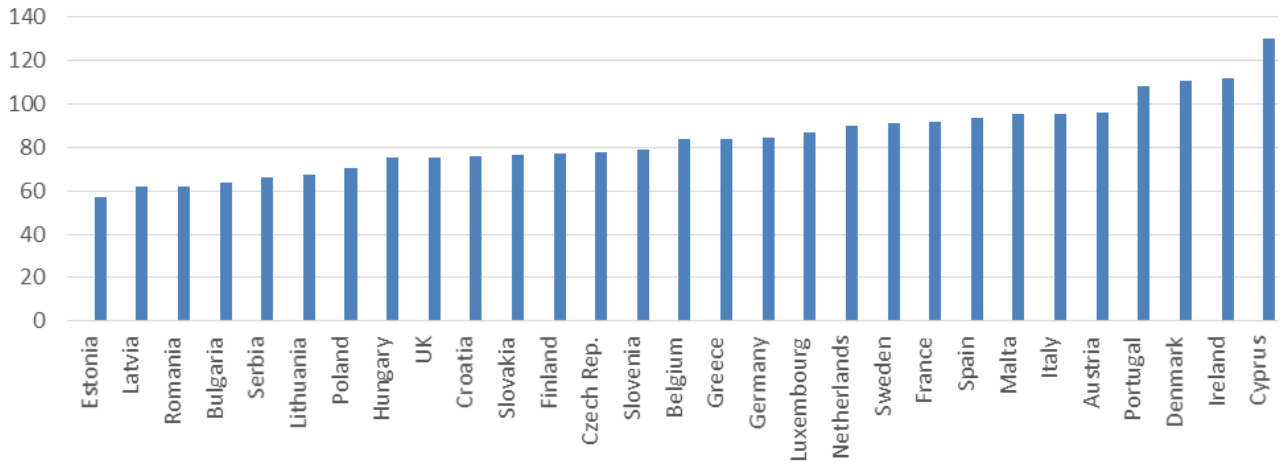



*Figure 2. Average size of residential dwellings in selected European countries, $m^2$ (Entranze data tool 2017).*

The age and state of the dwelling represent another set of material conditions that are likely to influence the opportunities for householders to reduce their energy use via investments (e.g. for installing a more efficient heating system) or changes in daily heating practices. The age of the building stock varies greatly across Europe (and within countries), as shown by the share of dwellings built before 1980 (Figure 3). The need for both renovations and dedicated heating control practices is greater in countries where the building stock is older and thus has a higher technical heat demand. There is also evidence that people compensate to some extent for poor physical building characteristics with lower temperatures and frugal energy use (Sorell et al. 2009). In old and poorly maintained buildings, the practices that are likely to save energy can be quite different from those that would save energy in new and highly automated buildings.

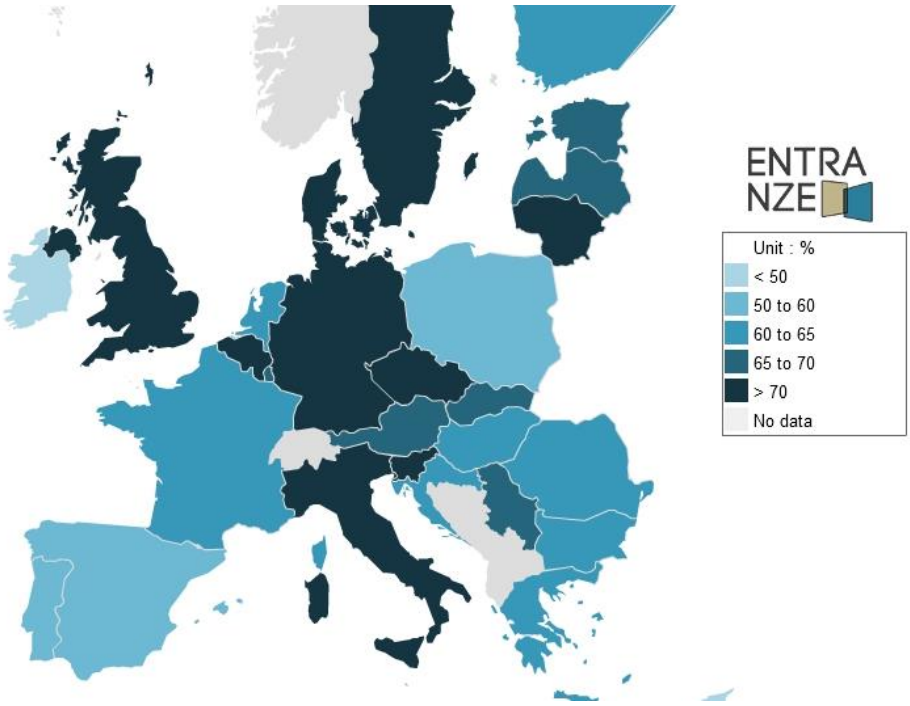



*Figure 3. Share of buildings built before 1980 in total building stock in Europe (ENTRANZE data tool 2017).*

Building type is a third category of material conditions influencing households' opportunities and need to reduce energy consumption. Households in single-unit dwellings (often known as single-family homes) have the greatest leverage while those in semi-detached, terraced and multi-unit dwellings (or multi-family dwellings or apartment blocks) vary considerably in their capacity to shape their domestic energy use. The share of these different kinds of dwelling types varies across Europe. Moreover, there are also variations in the socioeconomic status of householders living in single-unit or multi-unit dwellings. For example, in countries where are large share of the population lives in multi-unit dwellings (e.g. Southern Europe, Figure 4), apartments and flats are often occupied by middle-class occupants whereas single-unit homes might feature very diverse types of inhabitants, including low-income rural dwellers and wealthy suburban villa owners (Heiskanen et al. 2013). In other countries, where multi-unit dwellings are not the norm, they might house low-income households or particular socio-economic groups. For example, in Ireland rental apartments in multi-unit dwellings are generally seen as 'stop gap' housing solutions or

stepping stones towards property ownership (preferably of a detached dwelling with a garden or plot of land) and feature particularly transient groups of tenants as a result. These include students, young professionals but also people in receipt of housing support payments, none of whom are generally incentivised to retrofit or invest their own money in energy savings measures (Hearne 2017).

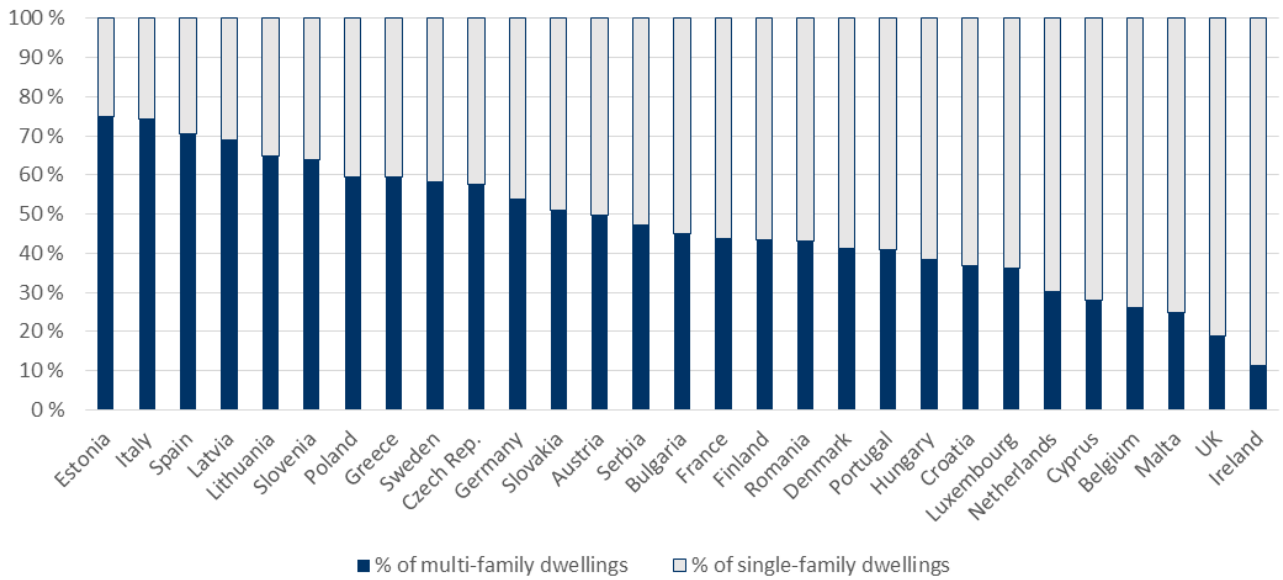



*Figure 4. Share of multi-unit and single-unit buildings (% of floor area) in the EU-27 (ENTRANZE data tool 2017).*

Heating systems and sources are a fourth category of material conditions influencing household heating practices which varies widely across Europe (ENTRANZE data tool 2017). For example, district heating is invariably connected to central heating systems that are relatively slow to respond to adjustments by users. District heating is widespread in e.g. Denmark (58%) whereas it has only a 1% share in the UK. Direct (resistant) electric heating is very easy to adjust. Electric heating is the main heating source in about 30% of residences in France and Finland, but less than 5%, for example, in Germany, the Netherlands and Hungary. Heating with wood-based fuels requires active effort by users, and its efficiency depends greatly on how systems are used. Wood-based fuels are used in about 50% of homes in Latvia and Romania, but in less than 5% in France, Denmark, Ireland and the UK.

**Institutional conditions** for reducing energy demand are closely related to material conditions in the case of home heating. In most countries, renovations cannot usually be undertaken individually in multi-unit buildings (legally, or according to established technical practice), although there are some exceptions. In Bulgaria, for example, it has not been unusual for individual apartment owners to insulate the wall outside their own apartment (Figure 5). Apart from these exceptions, renovation decisions are made and financed collectively, and in highly variable ways in different countries (Matschoss et al. 2014). Physically also, apartments in multi-unit dwellings are dependent on each other, since there can be a great deal of heat leakage between apartments. According to Weber et al. (2017), apartments situated in the middle of the building consume on average 40% less heat energy compared to flats situated in the top or bottom floors.

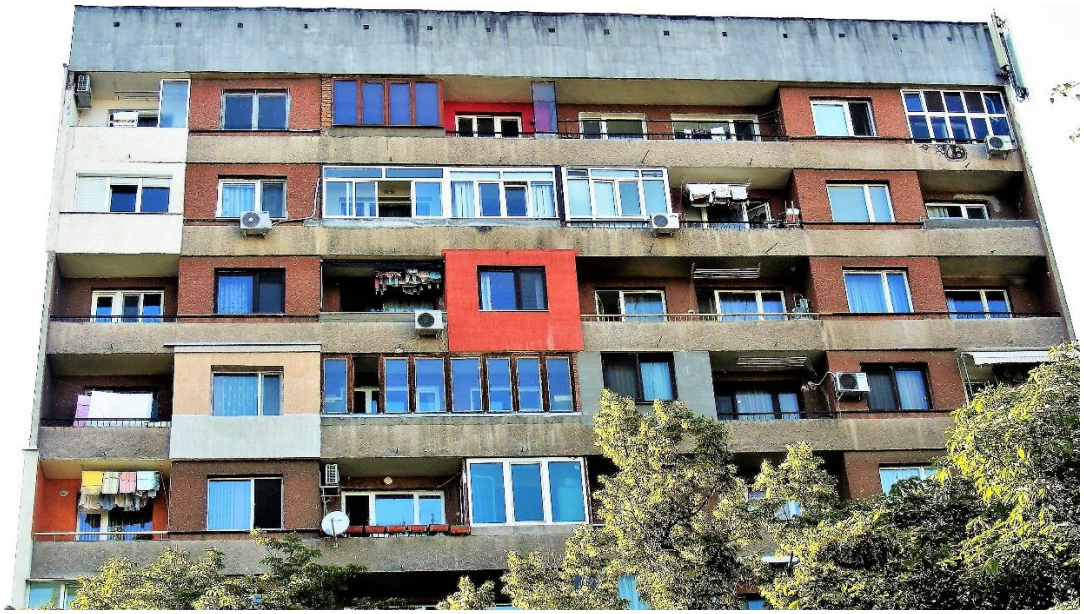


*Figure 5. Individually insulated apartments in Sofia (Photo: Marko Hajdinjak).*

Dwelling tenure is a distinctively institutional condition influencing households' opportunities to reduce energy demand. The difficulties of making energy renovations in rental buildings are well known, and there is a great deal of literature on the tenant-landlord, or principal agent dilemma, like the fact that landlords lack incentives to invest in energy renovations for buildings where the benefits would accrue to tenants (see Heiskanen et al. 2013) or, from the perspective of the tenant, the savings in energy use cannot offset the rent increase due to the renovation (Wolff & Weber 2017). This is particularly important in countries in which the share of rental apartments or buildings is high: for example, almost half of the population in Germany were in the rental sector in 2015 (Figure 6). However, the influence of building tenure on occupants' opportunities to influence energy demand plays out differently across Europe: where the share of owner-occupancy is high, low-income owner-occupants can struggle with high energy costs and lack of finance to renovate.

Institutional and material factors are strongly intertwined in how different dwelling types offer different opportunities (and place different requirements) on residents' active management of their energy use (Heiskanen et al. 2013). In this respect, single-unit dwellings are more similar across Europe, even though there are cultural and institutional differences between countries. Usually, single-unit occupants are used to making continual, incremental repairs to their homes, and the boundary between maintenance and renovation is not sharply defined (Heiskanen et al. 2013). Heating systems are more variable among single-unit dwellings even within countries, and occupants are likely to have a more active role in regulating their heating in several countries (Heiskanen et al. 2013).

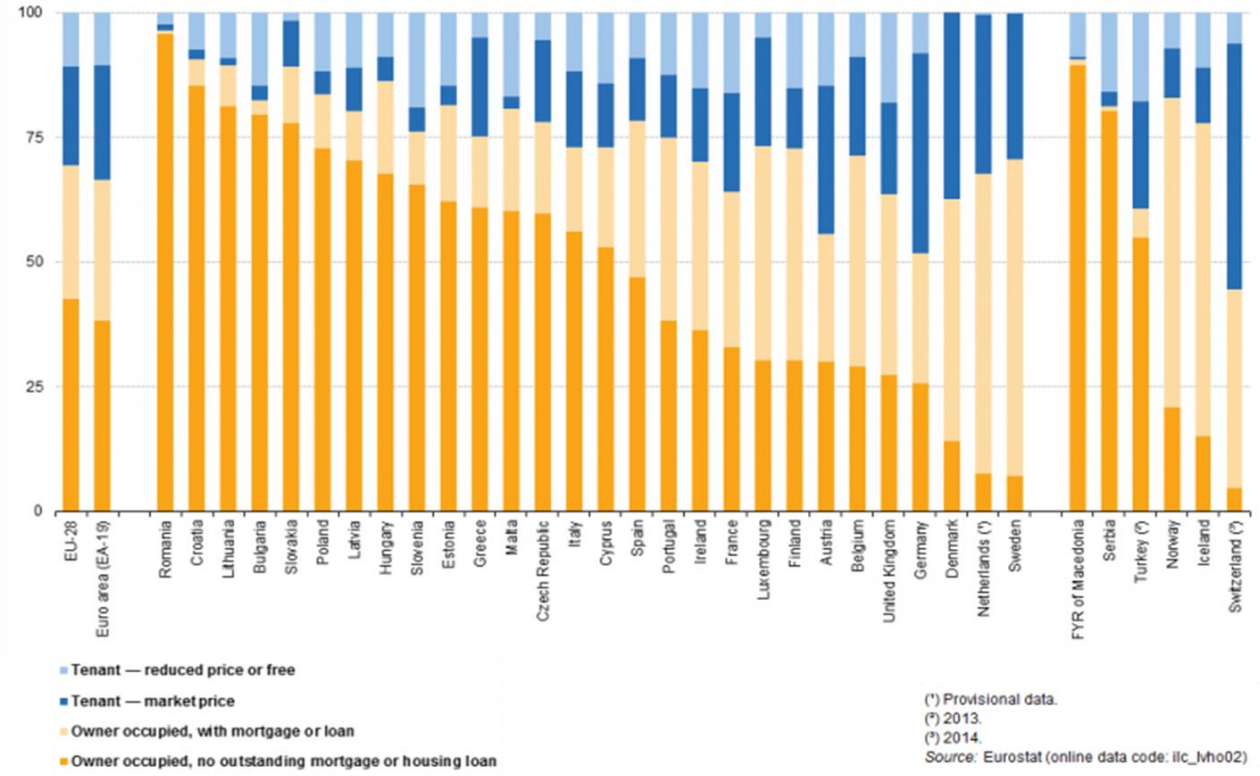



*Figure 6. Distribution of population by tenure status, 2015 (% of population. Eurostat 2017a).*

Individual billing of heat (or even individual heating systems) are common across most European countries, but there are still quite a few countries (Figure 7) where heating in multi-unit dwellings is still billed collectively as part of the rent or monthly charge, usually on the basis of square meters occupied (Schmidt 2014). In such countries, also the tenant-landlord dilemma is different. Landlords are usually incentivised to make renovations and other structural improvements, but on the other hand, changes in domestic heating practices do not benefit the tenants themselves but rather the landlord (Heiskanen et al. 2013).

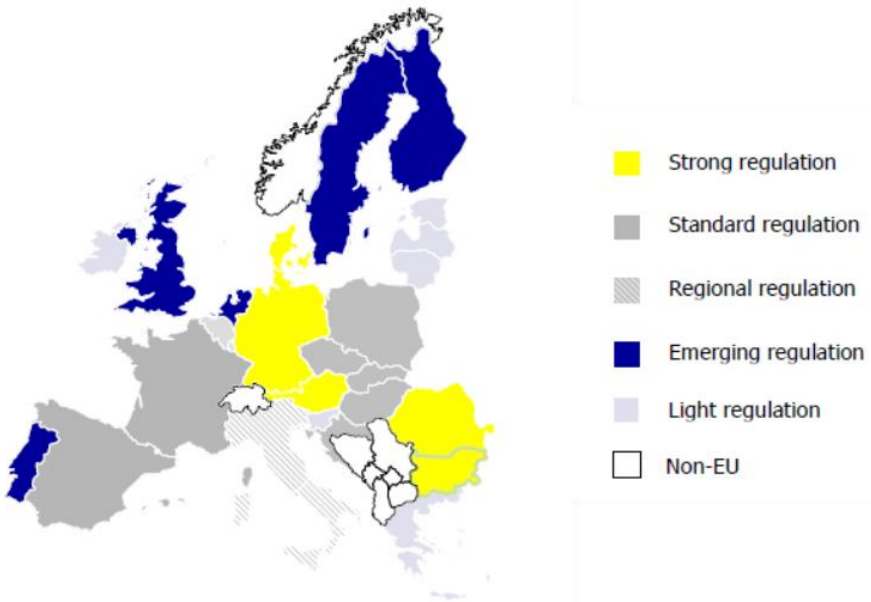



*Figure 7: Status of heat metering in MUD in Europe in 2014 (Schmidt 2014).*

**Socially shared conventions, such as** collective heating conventions and expectations concerning thermal comfort are also highly variable across Europe. Even the indoor temperatures used for energy standards range from 18°C to 22°C (Kemna & Acedo 2014). Nordic countries have the highest "official", recommended indoor temperatures (Finland 21°C, Sweden 22°C), southern countries (Spain, Italy, Portugal) about 20°C, whereas Western European countries have the lowest (18–19°C in the UK, Germany, Austria and France). Data on Central and Eastern Europe are not equally widely available, but Vavrá et al. (2016) report that the official recommended indoor temperature in the Czech Republic is 20°C. Actual temperatures frequently deviate from these recommendations. Alongside the obvious influence of physical building design and condition, Gram-Hanssen (2010) has identified three other elements of heating practice: embodied habits (such as childhood experience), rules and knowledge (deriving from different sources and occasions), and meaning and engagement (such as environmental or economic concerns, or concerns over comfort and cosiness). A large-scale survey among Austrian, Dutch and Hungarian citizens found considerable variation in which living room temperatures people feel comfortable with and significant country-specific differences: While the Dutch respondents reported feeling comfortable at indoor temperatures below 20°C, Austrians preferred several degrees warmer temperatures and Hungarians somewhere in-between. Consistently, people who feel comfortable at lower temperatures also more frequently reported turning down the thermostat "always" or "most of the time" when airing a room or leaving the house (Kammerlander et al. 2014).

Heating practices change over periods of several decades. For example, Vavrá et al. (2016) studied heating practices in three different regions and countries in roughly similar climate zones: Aberdeenshire (Scotland), Brandenburg (former East German state) and South Bohemia (Czech Rebulic). They found interesting combinations of reasons why, for example, indoor temperatures in Aberdeenshire were clearly lower than in Brandenburg or South Bohemia, even though heating costs were lower. They suggest that the historically inherited practice of low room temperatures throughout the UK has been embodied in practices, even when heating costs have declined. In a similar vein, they suggest that in South Bohemia, certain heating practices may have solidified when energy prices were lower, and persist even with higher energy costs. The rather moderate room temperatures in Brandenburg, instead, were suggested to have been shaped by education campaigns and a Germany-wide social norm of frugal energy use (Vavrá et al. 2016). While the overall historical trend across Europe has been toward greater expectations toward stable indoor temperatures, driven by technological change and commercial interests (Shove 2003), this observation suggests that collective conventions concerning indoor comfort can change in an energy conserving direction. However, Shove (2003) has also highlighted that most changes in conventions until now have increased energy use (for example, replacement of the *siesta* as a thermal adaptation practice with air conditioning in Mediterranean countries).

Not only are there differences in notions of comfortable home temperatures, there are also different expectations toward variability of temperatures within the home. In some countries and for certain age groups, centres of heat or "glow" may be very important for comfort and cosiness (Chappels & Shove 2005; Devine-Wright et al. 2015; Rohracher & Ornetzeder

2002; Thompson & Lidell 2014). In other countries, stable indoor temperatures are perceived of as a desirable characteristic[2]. There are also differences in people's tolerance of or disposition to regulate room temperatures when rooms are not in use. For example, in an OECD study including four European countries (Czech Republic, France, Italy and Sweden), Urban and Ščasný (2012) found that most respondents reported at least occasionally turning off the heat when leaving a room, except in Sweden, and that age and environmental concern were the strongest predictors of this type of practice.

## 2.2 DOMESTIC HOT WATER

Energy used for water heating in the home also varies greatly across Europe, depending on the temperature from which and to which it is heated, the amount of water consumed and the technologies used. However, differences also exist between countries that appear to be unrelated to temperature zones, as shown in Figure 8, which displays differences in energy use for domestic water heating across selected European countries. Other factors influencing hot water use and its energy demand are higher incomes and more convenient and constant availability of hot water (Shove 2003; EST 2013). For example, the increasing availability of central heating and large hot water boilers can contribute to expectations of constant and immediate availability of hot water, resulting in a more carefree use of water. For example, according to Motiva (2017), water use in Finland is significantly lower in single-unit dwellings (with individual boilers and energy bills) than in multi-unit dwellings (with collective boilers and averaged energy bills), which supports the notion that convenience, lack of awareness of or lack of incentives to reduce water use drive hot water consumption.

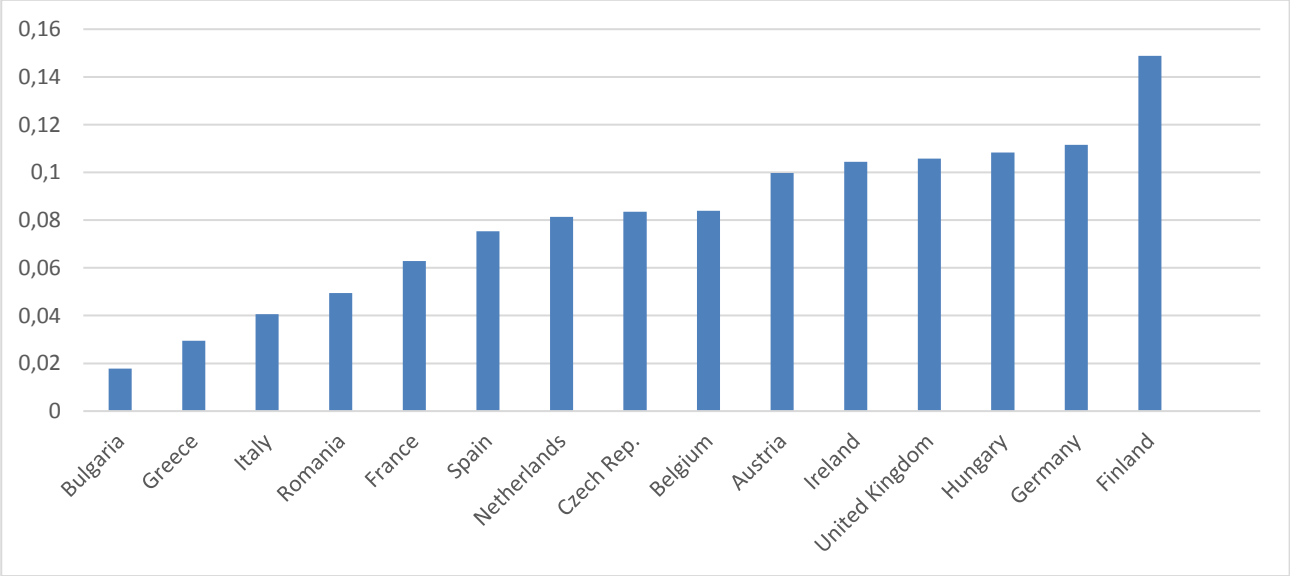



*Figure 8. Per capita consumption of energy for domestic hot water heating in selected European countries in 2009, toe (Calculated from the Odyssee database).*

[2] ENERGISE partners also suggested that in some countries, homes can be heated in order to show that the owner can afford a warm home.

Domestic hot water is technically easier to regulate than space heating, since energy use is influenced to a large extent by the amount of hot water consumed, as well as the temperature of the water. Hot water use can be influenced by low-cost investments like alarms or timers, low-flow showerheads, changed boiler settings in the case of individual boiler tanks, or by changes in bathing and showering practices. However, it may actually be more challenging to change notions related to issues such as cleanliness, comfort, leisure, convenience, health and psychological wellbeing, which influence the frequency of showering on a large scale (Browne et al. 2013; Shove 2003), and new cleanliness concepts might require new and different infrastructures (Kuijer & De Jong 2011) alongside new competences and meanings. Until now, at least in the UK, showering has increased over the decades (Hand et al. 2005). According to Hand et al. (2005), UK showering routines have changed radically in the past, and are likely to change again in the future.

**In terms of socially shared conventions**, some indications of variations within countries in hot water use can be drawn. According to Bartiaux et al. (2006), Belgians with higher incomes and living in single-unit dwellings bathe and shower more than the average person, whereas older people bathe and shower less, and no gender differences were observed in Belgium. Interestingly, only a few interviewees in this study were aware of the energy or environmental implications of hot water use. A study by Browne et al. (2013) on water consumption in the UK also shows that the practices of bathing and showering vary among age: for instance, people over 75 years of age bathe and shower with lower frequencies. This might be because of material aspects, such as unavailability of shower and restrictions on getting one installed, as well as age-related changes in e.g. activity levels and physical ability, but also due to people growing up in an era where daily showering was not a common practice. Davies et al. (2015a) found distinct gender differences in Ireland, where women associated showering more with cleanliness, grooming and therapeutic purposes. However, across the Irish sample, the most common category of showering practice (39% of respondents) was “the wake-up shower”, entailing routinised and engrained morning showers where wake-up and psychological functions of “starting the day” are primary motivations, in addition to feelings of cleanliness and physical presentation for work. In the Irish sample, wake-up showers were more common among younger respondents. Moreover, Davies et al. (2015a) found that people routinely underestimate their time spent in the shower.

## 2.3 PURCHASE AND USE OF HOUSEHOLD LIGHTING AND APPLIANCES

Electricity use for lighting and appliances in households has grown over the long term along with the introduction of new appliances and increases in the number of appliances per household (De Almeida et al. 2011). While lighting was the original purpose for supplying electricity to households, in 2010 it amounted to only 18% of domestic electricity use across 12 large European countries, and its share continues to decline with technical improvements in light sources (Figure 9).

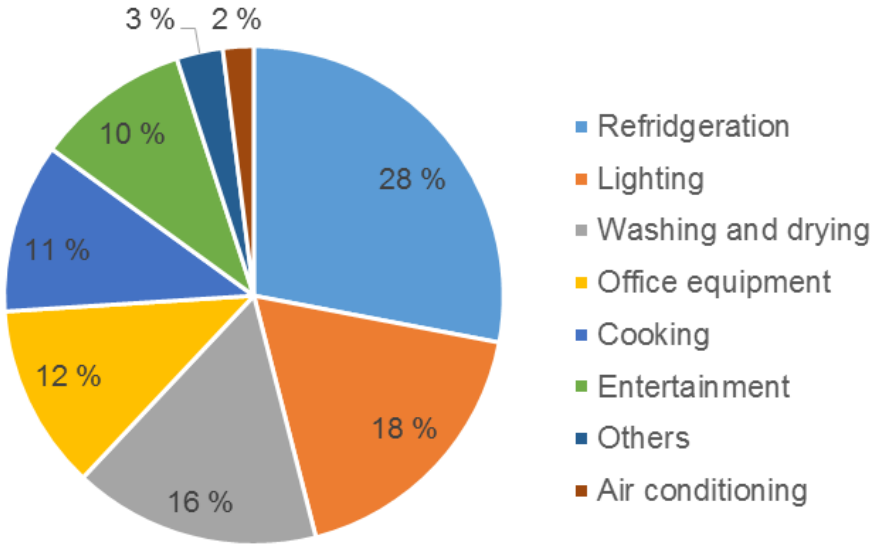



*Figure 9. Electricity consumption breakdown in households in 12 countries, excluding space and water heating (De Almeida et al. 2011).*

Household electricity use for appliances and lighting varies greatly by country. It ranges from 1,000–1,500 kWh (Estonia, Czech Republic, Romania, Latvia and Portugal) to around 3,000 kWh in the UK and Cyprus and to almost 4,000 kWh in Finland and Sweden (Odyssee 2015). According to Lapillone et al. (2015), the average level of electricity use for appliances and lighting in households across Europe is more weakly related to average incomes than other areas of household energy consumption indicating that there are other country-level factors involved. Due to technical advances in the efficiency of lighting and energy sources (largely thanks to European regulation), electricity demand in households has recently started to decline in the EU. During the 10-year period from 2004 to 2014, the electricity consumption by households fell in the EU-28 by 1.3%. Reduction was fast (28.6%) in Belgium, with reductions of more than 10% also being recorded for the UK and Sweden. To the contrary, household electricity consumption rose in 18 countries. The largest expansions were recorded in Romania (48.1 %), Lithuania (27.1%), Spain (21.8%) and Bulgaria (20.8%). These developments are likely to be influenced, in part, by socioeconomic and demographic changes. Other influences include the extent of ownership of electrical household appliances as well as the use of energy saving devices (Eurostat 2017b).

In the following, two areas that are relevant from a household practices perspective are explored in more detail: lighting and laundering (see Mylan 2015; Mylan 2016). These examples highlight how material conditions, attitudes, perceptions and social norms and energy use are closely tied up with each other, yet develop differently in different European countries.

**Lighting:** Electricity use for lighting varies greatly among European countries (Figure 10), and it has also developed differently in different countries. Energy efficient lighting equipment (e.g. LED) have gained significant market penetration in some countries like Sweden. At the same time, some of the same countries have experienced a rise in total electricity consumption for lighting due to increases in the number of lighting points (Lapillone et al. 2015). The EU Ecodesign Directive (2009/125/EC) has steered the market

away from incandescent bulbs by setting minimum standards for the energy efficiency of light bulbs. Indeed, since the publication of requirements for light sources, incandescent bulbs have been phased out, but to some extent, replaced with halogen lamps, which were until recently still sold in several countries (Mylan 2015; CLASP 2015). In addition, incandescent bulbs are still being used in many households (as they are still functioning or they were stocked while still available) and thus their replacement is still ongoing. Looking at more recent market developments, the adoption of efficient LED lighting appears very uneven even within Europe (CLASP 2015), though reliable statistics are still lacking. The developments might partly relate to the fact that the Swedish company IKEA has recently replaced its entire household light bulb range with LED bulbs.[3] In general, historical, institutional and social aspects of 'illuminating the home' influence the way new light sources are used, as well as how lighting patterns are configured and whether they become energy efficient (Jensen 2017c).

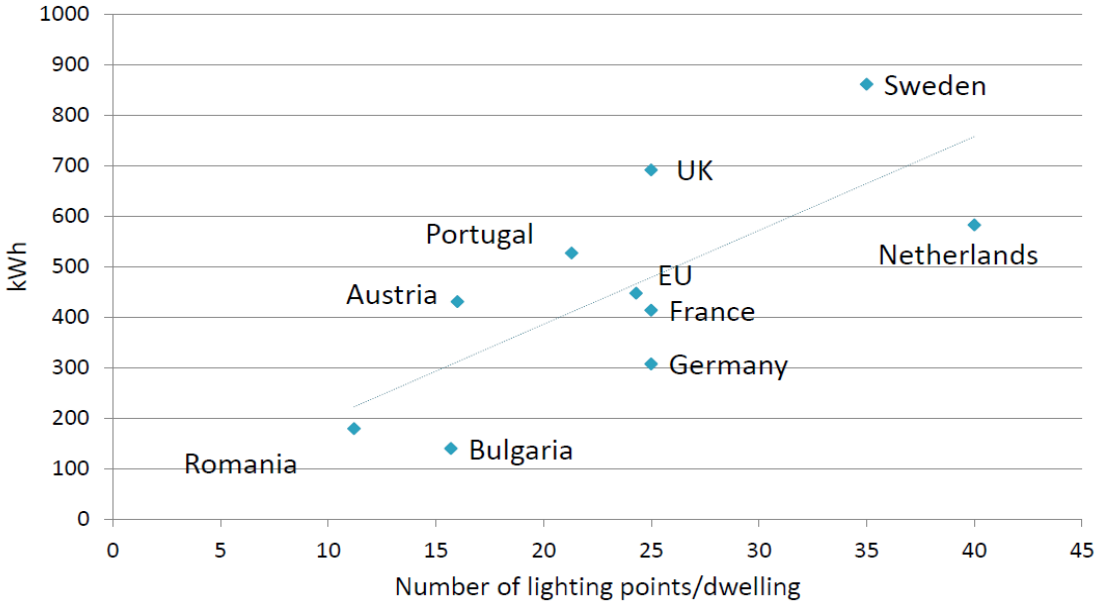



*Figure 10. Electricity consumption per dwelling for lighting (Odyssee 2015).*

**Laundry:** From a historical perspective, laundering has increased significantly in Europe as a result of technological advances and concurrent rises in standards of cleanliness, initially promoted by public health and hygiene movements and later by commercial interests (Shove 2003). According to Schmitz and Stamminger (2014), European households are washing clothes on average 3.8 times per week (ranging from 3.5 in France and Sweden to 4.1 in the UK and Italy, see Figure 11).

[3] Global Lighting Challenge 2017, see: http://www.globallightingchallenge.org/.

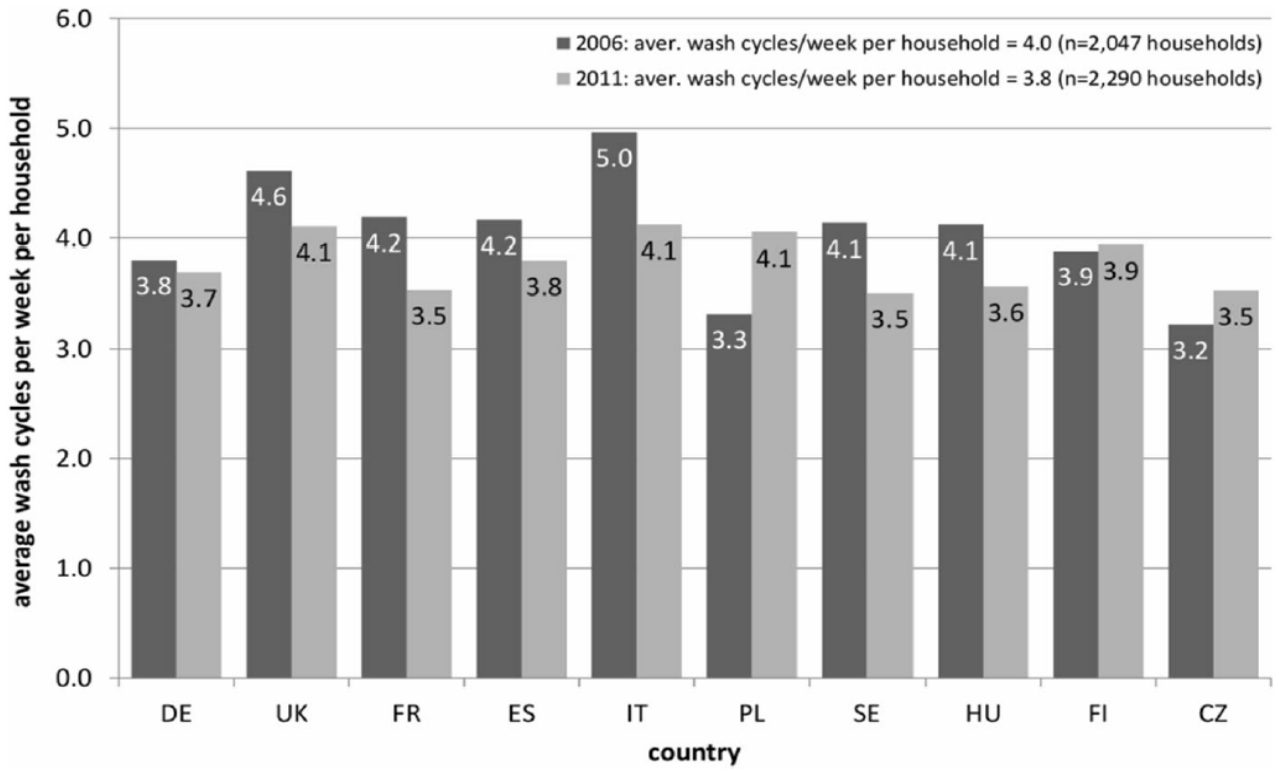



*Figure 11. Average number of wash cycles per week per household (Schmitz & Stamminger 2014).*

Attempts to introduce more energy-efficient laundry practices in Europe show the complexity of attempts to establish new practices on a large scale. The European detergent industry launched an initiative to promote low temperature laundry in households through low-temperature detergents, brand-led advertising and information campaigns urging consumers to wash at 30°C[4]. As a result, the proportion of UK consumers who report washing at 30°C rose considerably, from 2% in 2002 to 17% in 2007, and has continued to do so. However, according to Mylan (2015), the overall volume of laundry washed at low temperatures remains lower than the proportion of consumers engaging in low temperature washing, and in fact, low temperature laundry remains less favoured than higher temperature laundry in the UK.

AISE (2015) reports that in spite of progress in Europe-wide efforts to promote low-temperature laundry, washing temperatures appear to remain different in different parts of Europe: In Spain, almost 40% of the washes were carried out at cold temperatures, whereas in e.g. Nordic countries more than 50% of the wash temperatures chosen are at 40°C (see also Schmitz & Stamminger 2014; Figure 12). This directly relates to energy use of laundering, with Spanish households showing the lowest energy use with an average of 74 kWh/year. However, lower temperatures might partly be related to more frequent washing and higher ones to less frequent washing: higher average temperatures are more common in Nordic countries, according to AISE (2015), where common laundry rooms and hence weekly laundering days are also more common (Heiskanen et al. 2003; Mont 2004).

[4] We do not take a stand here on the chemical impacts of this 30°C initiative, or on whether people potentially use more detergent because they wash at lower temperatures.

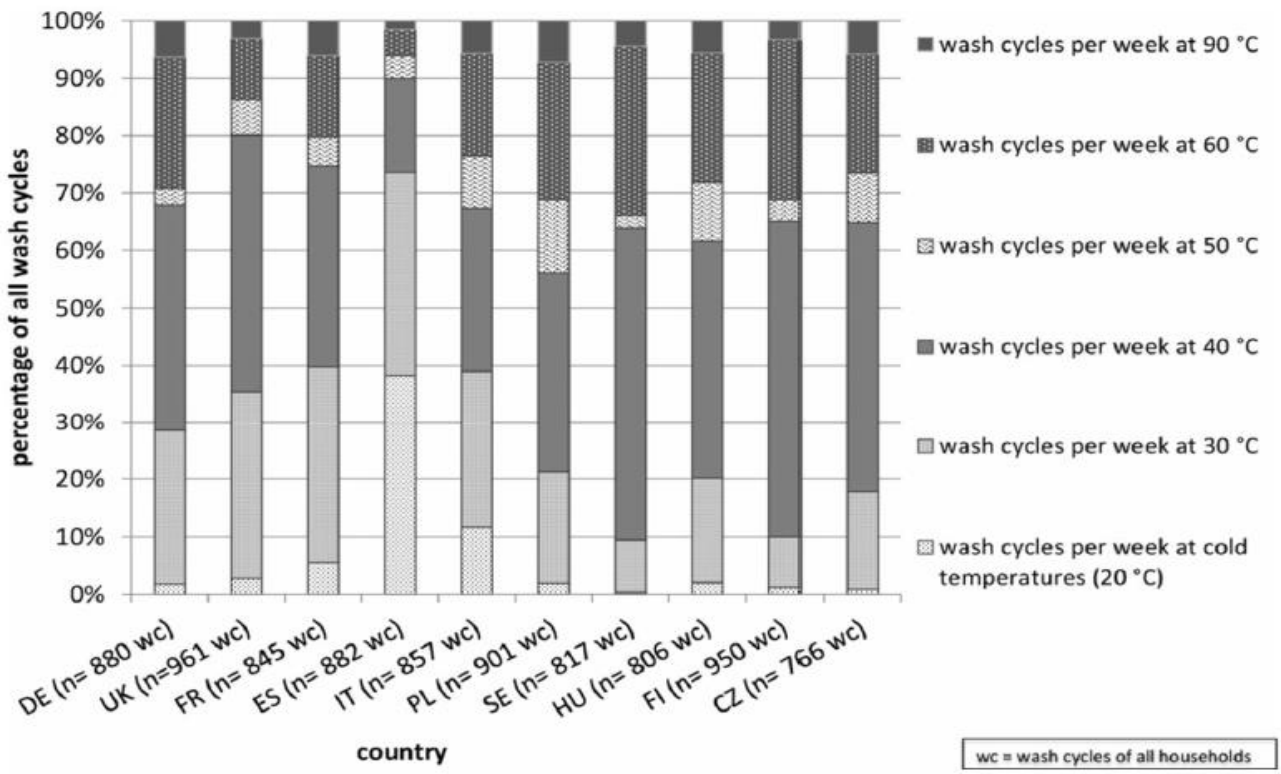



*Figure 12. Relative frequency of wash temperatures used in 2011 (Schmitz & Stamminger 2014).*

These examples on lighting and laundering show that progress in changing daily practices depends on concerted change in material conditions, institutions, consumer awareness and capabilities. They also show that change is usually very slow and non-linear, and can sometimes result in unexpected consequences for total energy demand, since elements of practices are connected to each other. For example, companies can promote energy efficient LEDs and bring down their prices through volume purchases, but at the same time, their interest is in selling more products. This can result in a larger number of light fixtures, thus reducing part (or even all) of the efficiency gains achieved.

## 2.4 MOBILITY

Transport accounts for around a third of all final energy use in Europe and for 24% of greenhouse gas emissions (in 2009). Private cars dominate the mobility domain across Europe: cars accounted for 83.4% of inland passenger transport in the EU member states in 2014 (Figure 13), with coaches and buses accounting for 9.1% and trains for 7.6%. Rail accounted for a higher percentage than bus travel in six countries (Austria, France, Germany, the Netherlands, Sweden, Switzerland and the UK). The relative importance of passenger cars was highest in Portugal, where cars accounted for 89.8% of passenger transport (in 2014). In most countries, the share of cars was 80-90%. The share was lower in seven countries, most notably in Hungary (67.5 %) where the importance of coaches and buses, in turn, was as high as 22.6%. The lowest share for coaches and buses was in the Netherlands (3.3%), and in the most countries this share was 10-20%. Trains accounted for more than one tenth of all inland passenger transport in Austria and Denmark, as well as in

Switzerland, while their share dwindle below 2% in Estonia, Lithuania and Greece, as well as in the Former Yugoslav Republic of Macedonia. In Iceland, Cyprus and Malta, there are no rail lines (Eurostat 2017c).

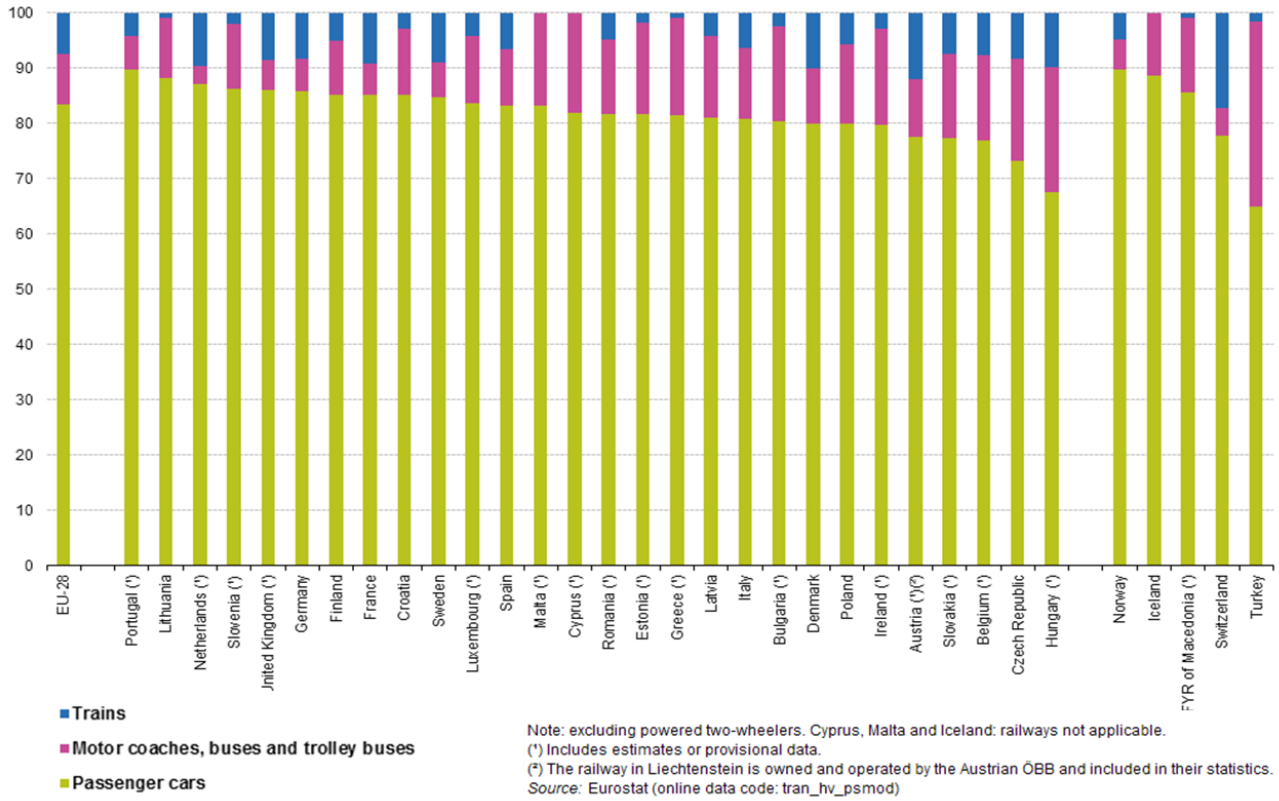



*Figure 13. Modal split of inland passenger transport in 2014 (% of total inland passenger-km, without sea and aviation. Eurostat 2017c).*

The popularity of the car as a means of being mobile relates to many different factors. Mobility connects many other everyday practices, such as those associated with working, shopping and having leisure activities. As Shove et al. (2015) illustrate, (perceptions of) temporal flexibility of car travel and the fact that cars allow people to travel further in a given unit of time than other modes (such as horses, bicycles or walking), have reshaped lives and geographies around these new capacities (see also Urry 2004). In a 'car culture', daily lives are built around the normality of car ownership and use, rather than car use being actively chosen (Aldred & Jungnickel 2014; Sheller 2012). This has happened at the expense of alternative modes: in all European countries, at least half of car users said that they did not use public transport because of a lack of connections (Eurobarometer 2011).

In addition to **material elements of mobility**, there are **meanings and standards** that perpetuate the dominance of the car by maintaining the normality of driving. In 19 out of 27 EU member states, about three-quarters (or more) of car users felt that public transport was not as convenient as a car. Reliance on cars or motorcycles for everyday activities ranges from 29% of the population in Hungary and Latvia to 91% in Cyprus (Figure 14). In Cyprus, only 3% of the population report relying on walking to access everyday activities compared to the one-third of the population in Latvia, Romania and the Netherlands. Pelzer (2010) discusses how cycling is linked to national Dutch identity, providing an important resource

for many Dutch people in supporting their cycling practices. By contrast, in the UK (with only 2% of people cycling daily), cycling is not linked to national identity but draws on specific local cultures and identities (Aldred & Jungnickel 2014).

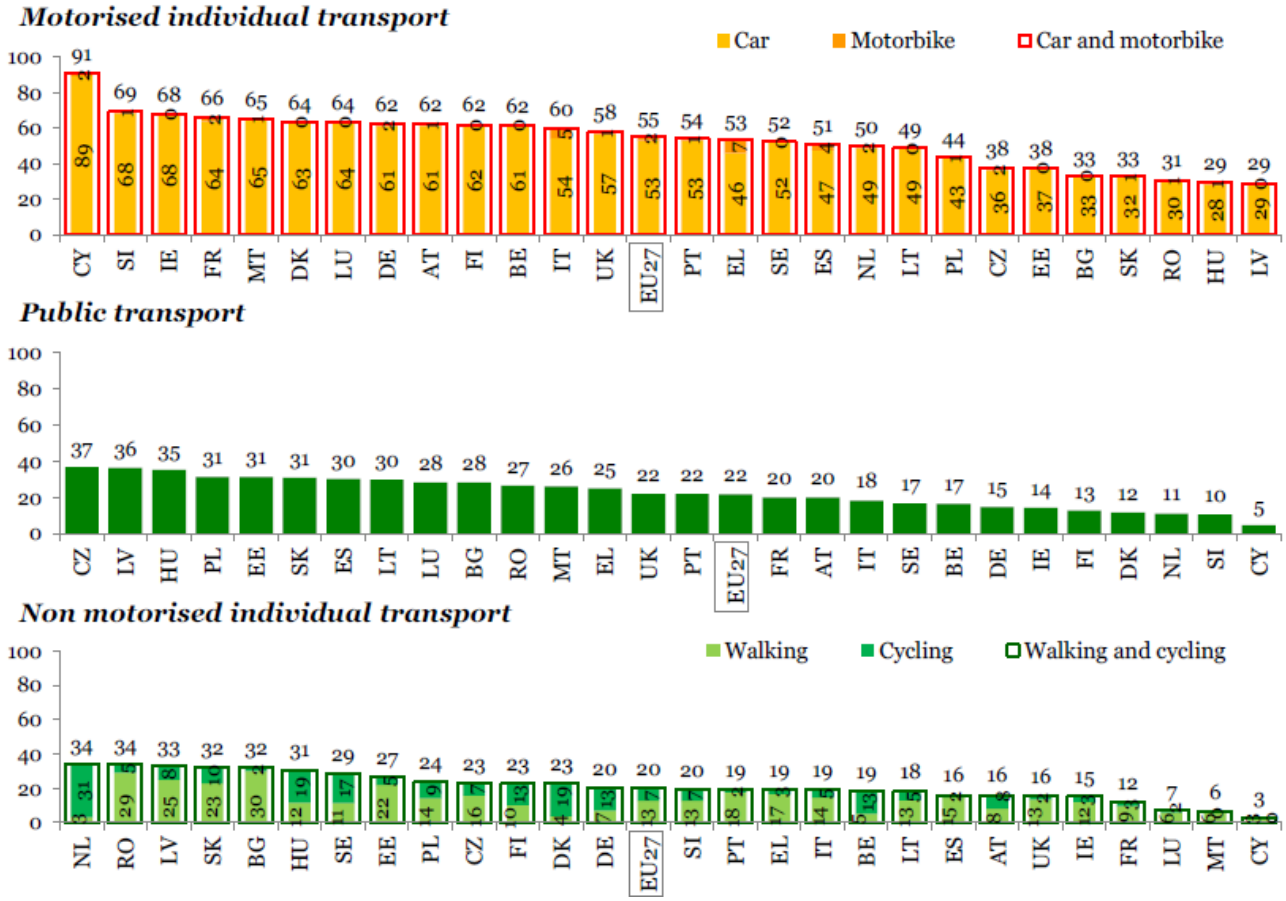



*Figure 14. The main mode of transport that the respondents use for their daily activities, of all respondents, % by country (Eurobarometer 2011).*

There are significant differences across the EU in terms of personal transport modes, including **between urban and rural areas**. Over the past 50 years, the urban population has grown steadily, with the strongest increase in towns and suburbs, and in newly developed residential areas surrounding existing cities. 72.5% of the EU-28 population lives in urban areas, with 41.6% residing in cities and 31.0% in towns and suburbs (TERM 2016).

Almost two-thirds of rural residents use a car to get about on a day-to-day basis; metropolitan residents, on the other hand, were almost as likely to mention public transport as they were to use a car as their main mode of transport (Eurobarometer 2011). Urban areas make greater use of public transport, walking and cycling, with less reliance on cars than non-urban regions (Figure 15). This may also benefit the surrounding areas: in metropolitan areas, public transport systems are co-ordinated on a regional basis. Differences in public transport between countries indeed seem to reflect the existence of strong metropolitan regions that developed as transit cities (e.g. London and Paris) as well as general differences in urbanisation (Haustein & Nielsen 2016). Nevertheless, metropolitan areas typically have higher levels of car use than main city areas, mainly because commuting distances are longer and public transport has more difficulties to

provide convenient services and widespread accessibility (TERM 2013). Cities with lower car ownership may also have a higher average car journey length – for example Greater Copenhagen has a very low car ownership rate (333 vehicles per 1,000 inhabitants) but the highest journey length (32 km). A possible reason for this is that those with the greatest need for private transport will purchase a car and use it, whereas most people rely on other travel modes (TERM 2013).

Walking, cycling and public transport are more prevalent inside main cities. Typically, more than 60% of modal share comes from these more sustainable modes of mobility (TERM 2013). The role of walking and cycling varies among the cities and the quality and provision of transport infrastructure has a clear influence on modes used.

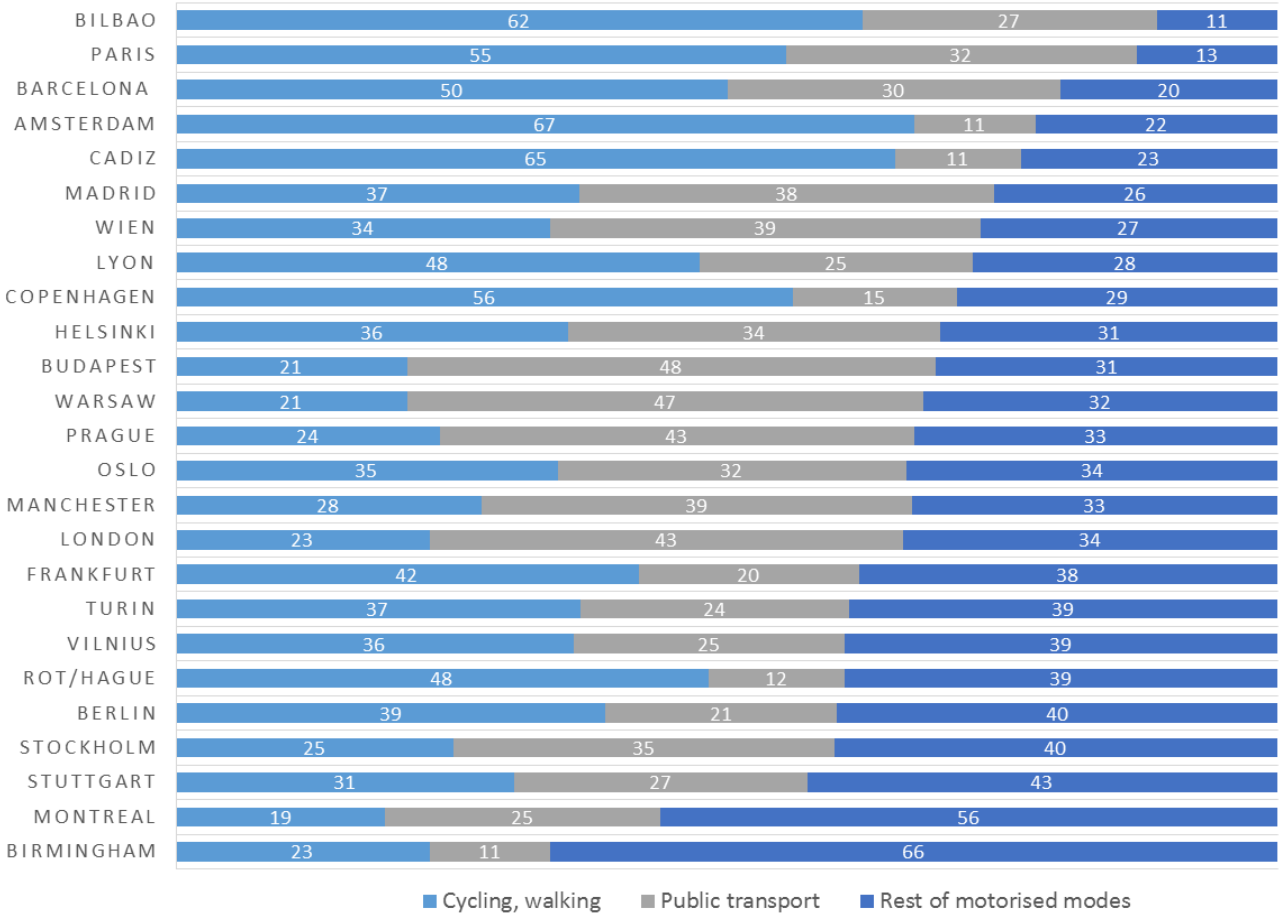



*Figure 15. Modal split for main city areas for 2015 (EMTA 2017).*

**Reasons for personal journeys** typically include work or school, as well as shopping, leisure and business trips. Commuting and education related journeys account for at least 25% of all journeys made in the metropolitan regions, but there are significant cross-national differences concerning trip purposes (Table 1).

*Table 1. Journeys from home to work and school as a percentage of total journeys for a selection of metropolitan areas (TERM 2013).*

| Metropolitan areas | Country | % home to work & to school journeys |
|---|---|---|
| Vilnius | Lithuania | 87.0 |
| Madrid community | Spain | 56.4 |
| Brussels Metropolitan | Belgium | 52.0 |
| Budapest (central Hungarian region) | Hungary | 46.6 |
| Valencia Metropolitan region | Spain | 45.7 |
| Cadiz Bay | Spain | 42.7 |
| County of Stockholm | Sweden | 38.0 |
| Turin Metropolitan region | Italy | 37.9 |
| Barcelona Metropolitan region | Spain | 37.1 |
| Paris Ile-de-France | France | 35.8 |
| Metropolitan area of Seville | Spain | 33.6 |
| Helsinki | Finland | 32.4 |
| Lyon Urban Community | France | 32.0 |
| Stuttgart region | Germany | 31.6 |
| Berlin-Brandenburg | Germany | 28.0 |
| Stadsregio Amsterdam | Netherlands | 26.0 |
| Birmingham (UK, West Midlands) | UK | 25.8 |
| Greater London | UK | 25.1 |
| Sheffield (UK, South Yorkshire) | UK | 25.0 |

These variations may be explained by cultural, historical and geographical differences in terms of urban (and rural) development. Car dependence may be due to planning favouring private driving, such as disparate siting of residential and commercial areas and spreading out of cities, lack of critical population masses required for the development of dedicated public transport networks, and other issues related to e.g. climate and policies providing limited opportunities or incentives to shifts to other transport modes (Kivimaa & Virkamäki 2014; Pucher & Buehler 2008; Spurling & McMeekin 2015). In contrast, the Netherlands, Denmark and Germany, for instance, have made cycling a practical way to get around their cities, by e.g. supporting cycling by bike parking and separate cycling facilities along roads, full integration with public transport, comprehensive traffic education and training of both cyclists and motorists, and a wide range of promotional events intended to generate enthusiasm and public support for cycling. In addition, there are taxes and restrictions on car ownership, use and parking. Strict land-use policies foster compact, mixed-use developments that generate shorter trips (Pucher & Buehler 2008).

## 2.5 SUMMARY: THE NEED TO FIT INTERVENTIONS INTO CONTEXT

This chapter has highlighted some of the differences in energy-related practices both between and within European countries, pointing to the complexities in recrafting or replacing practices. Our indicative findings suggest that adaptive practices (such as turning off heat in unused rooms and heating people rather than rooms) might be easier to introduce in particular practice cultures than in others, due to their material, institutional and social

elements. They also show how different the conditions surrounding European households are. These conditions provide diverse opportunities for changing everyday practices and related energy use and can lead change initiatives to result in unexpected consequences.

As suggested above, **material conditions** play a key role in the configuration and performances of practices. This is particularly the case concerning heating practices, where people in parts of Europe suffer from poorly insulated buildings and relatively high costs of heating. As an example, a study by Bartiaux et al. (2014) compared energy renovation practices in Denmark, Latvia, Portugal and Belgian Wallonia. Similarities across countries included the observation that energy renovation did not form a unified practice in any of the countries, but rather a bundle of somewhat disjointed practices. They also acknowledged the importance of social influence across countries. However, there were also some notable differences: for example, do-it-yourself renovations were common in Denmark and to a lesser extent in Latvia and Wallonia, but not in Portugal. They also suggest that the best conditions for the emergence of a new practice of retrofits could be found in Latvia, due to the inefficient building stock, cold winters, a majority of homeowners feeling the cold (a more unacceptable feeling given the current norms on comfort), and homeowners' inability to pay for increasingly expensive energy, as well as public support and readiness and openness of the public for retrofitting.

There are also **income and cost of living differences** between and within European countries. Because of this, households might have very different reasons for (not) changing energy-related practices. Some might desire to improve their level of energy service, since they struggle to keep warm, whereas others might have low concern for energy costs. Reasons behind this might relate to social security covering the costs of heating in low-income households e.g. in Nordic countries (where energy poverty barely exists, unlike in many other European countries). Similarly, an inability to carry out energy renovations due to dwelling tenure or other institutional or cultural conditions can influence householders' opportunities or willingness to reduce their energy demand. The differences in metering and billing practices also vary: in the UK, for instance, some households have a pre-pay system for electricity and heating, allowing them to follow their energy use (although these systems are often more expensive than billing), whereas in Finland the energy costs are included in the rent or monthly charge in multi-unit dwellings, with households remaining largely unaware of (and indifferent to) their energy use. In general, wealthy households have a greater potential for energy conservation due to their higher levels of consumption (and higher carbon footprints).

**Social norms and meanings** can also exert considerable influence on energy use, for example in relation to mobility: as the study of Bucher and Buehler (2008) shows, the Netherlands, Denmark and Germany have made cycling safe and convenient, making bicycle a 'normal' way to be mobile. To the contrary, cyclists are still marginalised in many places in the UK, and the stigma related to cycling reinforces the need for cyclists to develop protective skills and identities to maintain their practice (Aldred & Jungnickel 2014). The **time consumed** by different practices also plays a role in energy use: walking to work is more tempting in smaller cities with shorter distances, whereas trips often take longer in rural areas where people mostly drive cars, and in cities where people use public transport.

Time-use data from France, UK, Norway and the Netherlands show considerable variation in patterns of food preparation, eating at home and eating out – but also common patterns across countries, such as a decline in the amount of time devoted to food preparation (Warde et al. 2007). These changes have diverse implications for domestic energy use.

There are huge variations in energy use among households, which cannot be properly understood unless we get more in-depth insight into what everyday practices households actually engage in and perform in their everyday lives and why. It also has to be recognised that similarities in energy use might relate to very different types of practices: use of heat might relate to hot water consumption, extensive ventilation or high indoor temperatures, and electricity use might relate to very different practices such as extensive laundering practices or ICT use – or the use of electric cars (see Gram-Hanssen 2017).

While many relevant aspects remain unexplored, the above review clearly highlights that ELLs should not be designed on the basis of preconceptions deriving from one's own practice culture (cf. Akrich 1995). For example, assumptions about particular households being more or less susceptible to energy poverty may not necessarily be reflected in reality, especially if considered across different European countries. For example, our practitioner interviews (see Chapter 5) indicated that in Ireland middle-income households are particularly hard pressed at present due to mortgage arrears, which would have implications for both their ability and their willingness to engage in energy-saving practices. Ideas for changing practices that arise from a particular context (place, time and set of social relations) may thus be less valid in other contexts.

# 3 THE ENERGISE FRAMEWORK AND A PRACTICE APPROACH TO INTERVENTIONS

Combining an emphasis on culturally distinct aspects of energy demand and everyday practices with a focus on local, regional, national and EU policy efforts, ENERGISE aims to identify socio-cultural and systemic factors that influence efforts towards reducing energy use in households. The project moves beyond state-of-the-art energy consumption research and scholarship by theoretically framing changes in energy use as a transformation of shared everyday practices and related cultural conventions. A practice-theoretical approach to exploring methods of intervention in social life has been largely driven by the need to overcome the deficits of the "mainstream paradigm in pro-environmental consumer-oriented change attempts" (Keller et al. 2016: 77). Most of these mainstream approaches assume that people individually and linearly recognise and change their behaviour, whereas governments and other institutions act as enablers for people to make pro-environmental choices (Hargreaves 2011; John et al. 2016; Shove 2010a). These approaches marginalise other possible analyses and might even distract researchers and policy-makers from addressing the factors which give rise to unsustainable practices (Shove 2010b).

ENERGISE moves beyond this state-of-the-art research that focuses either on 'technical fixes' or 'social fixes' and proposes to use the concept of **practice cultures**, drawing explicit attention to the existence of **culture-specific sets of practices that result in specific patterns of energy use** that merit further social-scientific investigation both within and between countries (Rau & Grealis 2017). Routine human action is understood as a product of social practices influenced as much by the environment as by personal preferences or processes of deliberation (Kent 2015). Practices, rather than the individuals or the social structures, become the core unit of analysis. Wants, needs and emotions belong not to individuals but to the practices, and the contexts of everyday life are 'structured' by the practices and their routine performances (Shove et al. 2015; Warde 2005). Practices spread when (or if) they manage to 'recruit' new carriers, they are maintained and reproduced through 'faithful performances', and they disappear when they are displaced by new practices (Shove 2003; Shove & Pantzar 2005). Individuals should not, however, be seen as passive carriers: for a practice to be performed, the actions need to make sense to the individual. Schatzki (2002: 75) calls this practical intelligibility, a phenomenon that governs actions by specifying what an actor "does next in the continuous flow of activity". In addition, individuals need to be able to participate in social interplay and evaluate the performances with respect to normality and the standards of different social sites (Laakso *forthcoming*; Røpke 2009; Sahakian & Wilhite 2014).

A widely shared notion of practices is that they are constituted of *configurations of elements*, such as shared meanings, norms and rules, knowledge and competences, and materials, technologies and infrastructure (Gram-Hanssen 2011; Shove et al. 2012). Practice theory steers attention away from isolated elements to their constellations and combinations, and to the ways shared elements connect practices. Practices change when the connections between elements change or are made or broken; changes in one practice can be expected to affect other practices sharing the same elements; and changes in configurations of

bundles and complexes of practices may change practices as well (Gram-Hanssen, 2011; Jensen 2017c; Shove et al. 2012). Following this, it is necessary to pay attention to this whole network of practices when practices are steered to more sustainable paths.

Practices can be perceived as both *entities and performances* of a practice. Practices-as-entities are formed as a collective achievement and capture the underlying organisational principles or linkages that shape the actions that make up the practice (Heisserer & Rau 2015). Habits and routines — the individual performances — can be conceptualised as the reproduction of these stable social practices, but performers of practice can nevertheless "adapt, improvise, and experiment" with ways of doing, thus transforming the practice (Warde, 2005: 141). Practices can undergo phases in which they are initiated by innovations, spread around a community of practitioners and differentiated in various performances (Bellotti & Mora 2016; Shove et al. 2012). The organisation of a practice, however, determines whether certain actions are deemed correct or appropriate (in certain situations) and signals what actions are more or less important and how they follow one another (Aro 2016; Heisserer & Rau 2015).

Based on these dynamics of practices, Laakso (2017a) develops some suggestions for interventions. First, attention should be paid to the dynamics both within and among the practices: which elements constitute the practice and how practices are connected to other practices. Most research in e.g. the transport sector has focused on materials or competences and has not paid attention to meanings and the interconnectedness of elements (Cairns et al. 2014). Second, it might prove fruitful to look beyond individual practices, towards the alliances and conflicts within and among 'complexes of practices' in particular domains of everyday life (Halkier & Jensen 2011; Jensen 2017c) and how "lessons are learned, innovations borrowed, procedures copied" from adjacent and parallel practices (Warde 2005: 141), as well as how these circulations might form and institutionalise new connections and configurations (Genus & Jensen 2017). Thirdly, as the organisation of practices determines the 'correct' performances of a practice, understanding practices requires understanding of what is perceived as 'normal' and 'acceptable' in the specific context (Aro 2017). The site in which practices take place should be considered as a multifaceted environment, where practices are defined not only by social, cultural or infrastructural dynamics, but also by the dispositions and agency of people who participate in them (Backhaus et al. 2015). The variety of performances implies that performers may associate different meanings to the same practice, may attribute importance to various competences, or may experiment with different materials (Bellotti & Mora 2016). Lastly, attention should be paid to relationships between practices and social relations that they support and uphold and which, in turn, ensure that those practices are maintained, reproduced, critiqued and challenged (Davies & Doyle 2015; Hargreaves 2011; Kent 2015).

A practice-based intervention is thus a programme to "disrupt, relocate, innovate, redirect or otherwise reorient" the practices in question (Strengers et al. 2015: 74), and the question "how to change individuals' behaviours" should be reframed to "how to change practices and their performance" (Evans et al. 2012; Welch 2016). For an effective intervention drawing on a practice perspective, Spurling et al. (2013) provide three framings: '*re-crafting*

*practices', 'substituting practices' and 'changing how practices interlock'*, which provide means for identifying targets for policy intervention (Table 2).

*Table 2. Intervention framings adapted from Spurling et al. (2013) by Jensen (2017b).*

| Problem Framing | Target of Intervention |
|---|---|
| **Re-crafting Practices** | E.g. Initiatives that introduce interventions in several elements of practice be it in terms of material changes, changes in competences or changes in socially shared images and meanings. It can be initiatives that uses various outlets for promoting change, like the New Nordic Diet that challenges the material element of a diet (food), the competences required to prepare certain meals (new cook-books) as well as socially shared meanings attached to 'good food' (making Nordic meals trendy). |
| **Substituting Practices** | E.g. Initiatives that recognise that performances of practices requires space and time, and therefore practices compete for time and space. Practices of commuter driving and commuter cycling compete. If a practice of commuter cycling is to disperse, interventions should focus on making time and room for such a practice; e.g. making more room for bikes on the road, create facilities for showering at destinations, maintenance possibilities, and help advocating for a socially shared acceptance of biking to work (including spending the time needed to bike rather than driving. The aim would be for people to defect from a practice of commuter driving and to be recruited to a practice of commuter cycling. |
| **Changing how Practices Interlock** | E.g. Initiatives that challenge the sequence of practices or the organisation and institutionalisation of everyday live. It could be initiatives that promote working closer to home and maybe in hub-offices that would encourage people to meet across lines of work (decreasing the need for mobility, and maybe encouraging people to socialise differently and eat together, changing configurations or practices of eating, working and socialising) |

The first target of interventions is to reduce the resource-intensity of existing practices through changing the elements which make up the practices (Sahakian & Wilhite 2014). This does not mean subscribing solely to the technological view where new applications solve problems, but calls for a thorough investigation of how technologies and things co-evolve with use and how different elements are connected to each other (Gram-Hanssen 2011; Shove 2003; Spurling et al. 2013). Examples of re-crafting practices could be related to changing how driving is done by information campaigns and normalising fuel-efficient driving, or reducing food waste by creating new ways to distribute and serve food (Spurling & McMeekin 2015; Laakso 2017b). The second framing of substituting practices begins with the question "what is a practice for": daily mobility, for instance, is not just defined by whether or not we want to use a car but by a series of complex and interconnected activities and constraints (Chatterton et al. 2015; Laakso 2017a). Shove and Walker (2010) describe how the congestion charging scheme in London (which also included a parallel programme of investment in public transport) significantly reduced private driving. Addressing interdependent, co-evolving practices opens up space for a more comprehensive intervention. The ways practices are interlocked is thus closely related to other intervention framings, as the linkages between elements holding practices together play a central role in all interventions. Spurling's et al. (2013) example of new 'community hubs' that reduce the need for commuting and address challenges of working from home shows how practices interlock and how changes in infrastructures can offer great opportunities for change.

Recent years have seen some practice-based suggestions for how to reduce household energy use. When it comes to space heating and cooling, these are often linked to the notion of heating the person rather than the entire room (Kuijer 2014; Sahakian 2014; Strengers 2014). They promote an adaptive approach to indoor comfort, which is likely to be received differently in different countries, depending on whether households are used to an active role in heating, or whether they have become accustomed to even indoor temperatures and highly automated temperature control, where user involvement might even be actively discouraged. In Finland, the LAICA project focused on the links between elements of practice and their potential for continuity and for reconfiguration in e.g. heating practices in detached housing (Jalas et al. 2017). Their examples illustrate how normality is challenged by ruptures in everyday life, such as long blackouts or lower-than-average temperatures.

Some studies have investigated practice-based approaches to reducing hot water use. For example, on the basis of analysing bathing practices in the Netherlands, Japan and India, Kuijer and De Jong (2011) conceived a new energy-conserving bathing practice called Splash[5]. The CONSENSUS Washlab project designed an adaptive water scenario, among others, where ICT would communicate fluctuations in water availability linked with variable water charges, social benchmarking information and suggestions for appropriate forms of washing, alongside automatic adjustments to flows of water-using devices (Davies et al. 2015b). This technological component would be complemented by the promotion of adaptive washing skills including the use of splash or gel washing to achieve cleanliness in times of low water flow. In Melbourne, 31 people were engaged to wear the same pair of jeans for three months without washing them. The intervention thus focused on the conventions of cleanliness, and the participants reported that they had also started to wash their other clothes less frequently (Jack 2013). The participants testing the Splash concept experienced the new way of bathing as rewarding, effective and relaxing, but also reported discomfort, mainly because of incompatibility of this way of bathing with bathroom designs (Kuijer & De Jong 2011). In the Washlab follow-up study, participants reported that they had continued taking shorter showers and using devices (such as timers and water meters) to save water. In contrast, households did not continue incorporating novel products (such as dry cleaning or 2-in-1 products) in their routines (Davies et al. 2015b).

Despite the examples above, most interventions in household energy use have not yet been specifically built on practice theory. Rather, they target individual elements of a practice through technical innovations, encouraging consumers to choose more sustainable options, or discouraging them from less sustainable behaviours (Spurling et al. 2013). Technological innovations such as electric cars, and policies supporting these technologies, for instance, have often left existing travel patterns, and needs to be mobile, intact. This can limit the potential for change and unwittingly encourage or lock-in unsustainable practices (Røpke 2009; Spurling et al. 2013), which can be both material (infrastructure, technologies) or social (norms, rules, prescriptions) (Sahakian 2017). It is thus important to adequately understand the practices that need to change – their constitutions and connections – and identify the range of necessary interventions to shift practices onto more sustainable paths.

[5] 'Splash' included a basin containing warm water, a seated position and a ritual of splashing water over the body with a scoop (Kuijer & De Jong 2014: 4).

# 4 RESEARCH EVIDENCE ON INTERVENTION EFFECTIVENESS – A CRITICAL SYNTHESIS FROM THE ENERGISE PERSPECTIVE

The practice-based approach to designing interventions has not been much used yet, but most of the research and development on households' energy conservation has focused on individual interventions that are expected to trigger savings, either alone or in some combination or mix of interventions (see Spurling et al. 2013). Much of this research might be categorised as what Elizabeth Shove (2010a) calls an ABC (attitude-behaviour-choice) approach, though there are actually several underlying models and some of the research is not based on, e.g., concepts such as attitudes, values or choices (Dubuisson-Quellier 2016). This research has been criticised for focusing on discrete behaviours rather than overall energy demand and for its methodologically individualist stance (e.g. Strengers & Maller 2015; Wilhite et al. 2000). However, it is interesting to investigate what this research has to say – or what it neglects to say – about which interventions have been shown to **have an effect on household energy conservation**. Considering the prospects for cross-cultural interventions, it is important to understand **how intervention effectiveness depends on context** (such as the local practice cultures)**.**

Our focus here is on experimental research that aims to produce evidence on the effectiveness of discrete interventions (Rossi et al. 1999). Thus the focus is on interventions that draw on a particular (usually psychological) construct, can be targeted at an experimental group (ideally with a separate control group) and which are expected to deliver results (that can be linked to the intervention) in a fairly short period of time. There are also other ways that government can attempt to influence consumption (and shape practices) which may be influential but where the effect cannot be directly and unequivocally linked to the interventions. Examples mentioned by Dubuisson-Quellier (2016) include instruments (like information campaigns or climate calculators) that aim to construct reflexive capabilities among citizens, instruments that modify choice architectures via regulatory means such as bans or obligations, and instruments that work via "rationalisation", i.e., enhancement of people's ability to make particular kinds of choices, via e.g., economic instruments or environmental labelling.

This chapter first investigates the existing research evidence from meta-analyses and systematic reviews concerning various interventions to support energy conservation in the home. Very few peer-reviewed studies have quantitatively investigated the impact of country or target group context on the effects of interventions to save energy in the home. We start with some general observations from reviews and meta-analyses in order to identify the group of interventions that usually are applied when discussing household energy interventions. We then turn to the (meagre but suggestive) evidence on the impact of contextual factors.

## 4.1 INTERVENTION EFFECTIVENESS

In a highly cited review of intervention studies, Abrahamse et al. (2005) categorise the interventions into two categories: (1) *antecedent interventions*, which mean commitment, goal-setting, information, workshops, mass media campaigns, audits and modelling (i.e., providing examples of recommended behaviour); and (2) *consequence interventions*, or feedback (continuous, daily, weekly or monthly, comparative) and rewards. The review found that information alone (e.g. mass media campaigns) is not generally an effective intervention. More specific information, like energy audits, resulted in energy savings. The antecedent interventions 'commitment' and 'goal-setting' were found to be successful in changing energy-related behaviour, especially when combined with feedback. Rewards were found to be effective, but indications were also found that the positive effect can disappear once the reward is removed. Feedback, especially when given frequently, was found to be an effective intervention, but it was also found to work differently for low and high energy consumers, with low energy consumers sometimes even consuming more as a result (see also Diffney et al. 2013).

Since the Abrahamse et al. (2005) study, attention has shifted, in particular to investigating the impact of descriptive social norms as an intervention. Descriptive social norm information draws on people's desire to converge toward behaviour that is perceived of as normal or appropriate (Cialdini et al. 2006; Rettie et al. 2014; Toner et al. 2014). Descriptive social norms are also of interest in the context of a group of interventions suggested in behavioural economic theory (Mont et al. 2014; Lehner et al. 2016). Lehner et al. (2016) provide an overview of the existing evidence concerning the effectiveness of such interventions (Table 3).

*Table 3. Interventions suggested in the behavioural economics literature and evidence of effects (Lehner et al. 2016).*

| Interventions | Applications to residential energy conservation | Evidence of effects on energy savings |
|---|---|---|
| Simplification and framing of information | Feedback on energy consumption: Informative energy bills, metering and displays | Evidence exists on different scales: tailored and small-scale interventions render 1-20% savings, large field trials about 2% |
| | Energy labelling of appliances and buildings | Experience on a large scale, but limited evaluation of effects |
| Changes to the physical environment | Design for sustainable behaviour, Design with intent (design of space in the home, design of appliances to facilitate 'correct' use) | Small scale trials, little evidence of the size of the effects<br><br>Standard in some environments such as hotels (key card removal turns off lights) |
| | Prompts as reminders of appropriate behaviour | Small scale trials, evidence of effectiveness as part of a package of interventions |
| Changes to the default option | Opt-out green electricity offers | 95-99% of customers stay with the "green electricity default" |
| | Opt-out from smart grid trial (technology installed to control consumption) | Large effects (20% more agreeing to participate with opt-out) in one survey study |
| Use of descriptive social norms | Social comparison billing feedback | Large effects in small scale trials (average 11%), smaller effects in large field trials (e.g. 2% savings) |

Meta-analyses of intervention studies, however, suggest that there is variation in the effects of interventions, both in terms of significance (whether they have a statistically significant effect) and in terms of effect size. For example, Osbaldiston and Schott (2012) conducted a meta-analysis of 87 published studies of 253 experimental interventions that involved an observed pro-environmental outcome (recycling, energy conservation in the home, driving behaviour). Table 4 summarises their findings concerning weighted average effect sizes (for all interventions, column 4, and for home energy conservation interventions, column 5), which is a measure of how much the experimental group differs from the control group (difference in means divided by pooled and weighted standard deviation). An effect size of 0.2 means that the intervention increased the desired behaviour by 8%, one of 0.5 that the intervention increased the desired behaviour by 19% and one of 0.8, an increase of 29% (Osbaldiston & Schott 2012).

Osbaldiston and Schott's (2012) meta-analysis shows there is quite a large variation in how effective different interventions are in influencing different kinds of behaviours (recycling, water, energy, etc.). Moreover, there is variation in how effective different combinations of interventions are, since some combinations (e.g. making it easy combined with prompts, or goal-setting combined with instructions) outperformed other combinations. The findings concerning the effectiveness of commitments (both alone and in combination with other interventions) are reinforced by a dedicated meta-analysis (Lokhorst et al. 2013) focusing only on studies involving commitment interventions (n=19).

*Table 4. Selected results from Osbaldiston and Schott's (2012) meta-analysis of experimental pro-environmental behaviour interventions.*

| Category | Intervention type | Example | Weighted average effect size: All interventions | Weighted average effect size: Home energy interventions |
|---|---|---|---|---|
| Convenience | Making it easy | Providing low-flow showerheads | 0.49 | n.a. |
| | Prompts | Reminder to turn off lights when leaving room | 0.62 | 0.00 |
| Information | Justifications | "Why-to" information e.g. how much material is dumped that could be recycled | 0.43 | 0.17 |
| | Instructions | "How-to" information, e.g. use blinds to avoid overheating | 0.31 | 0.17 |
| Monitoring | Feedback | e.g. monthly electricity billing | 0.31 | 0.28 |
| | Rewards | Cash, coupons, rebates, prizes | 0.46 | 0.45 |
| Social-psychological processes | Social modelling | Demonstration of desired behaviour by peers | 0.63 | 0.74 |
| | Cognitive dissonance | 'Foot-in-the-door' intervention where participants asked for a small act first | 0.93 | 0.29 |
| | Commitment | Pledge cards | 0.40 | 0.55 |
| | Setting goals | Aiming for e.g. 20% reduced power consumption | 0.69 | 0.31 |

There are some combinations that were not investigated in the Osbaldiston and Schott (2012) study. For example, Alberts et al. (2016) investigated how introducing a competition influenced the effect of individual and social norm feedback on a group of price-insensitive participants (students). It turned out that introducing the competition undermined the effect of the social norm information, suggesting that the introduction of an extrinsic motivation

crowded out the intrinsic motivation to participate and resulted in tactical behaviour, since only few students would be likely to win. On the other hand, Maki et al. (2016) found that financial incentives might in some case even increase intrinsic motivation when they are interpreted as evidence of the participants' competence (i.e., the financial reward serves as a form of feedback).

As another example, Delmas et al. (2013) conducted a meta-analysis of 156 experimental studies (mostly from the USA) investigating various interventions to promote electricity saving in households (energy saving tips, audits and consulting, various kinds of feedback, monetary savings info and monetary incentives). On average, the interventions applied in the studies rendered a savings effect of 7.4%. When modelling the effects in combination with the entire set of interventions, Delmas et al. (2013) could not find (independent) conservation effects from some of the interventions (which are often deemed effective), like individual usage feedback and comparative feedback (though they noted that the sample included few studies testing comparative feedback). Yet they found that real-time feedback and home energy audits triggered energy conservation. They also found that the effects of the interventions declined over time. Monetary savings information was found to actually increase energy usage, which Delmas et al. (2013) interpret to be due to the fact that the savings to be obtained from electricity conservation are relatively small in the typical US context.

When it comes to mobility, in a systematic review of 22 studies focusing on modal shift to walking and cycling, Ogilvie et al. (2004) found a lack of good evidence on the effectiveness of interventions. However, they concluded that interventions that engage people in a participative process and address factors of personal relevance may be more effective than those that simply aim to raise awareness or impose changes in the physical and economic environments. Also Yang et al. (2010) found a lack of strong evidence, concluding that it is unclear whether increases in cycling could be achieved by addressing attitudes and perceptions about cycling. Conversely, a lack of supportive infrastructure might limit the willingness of people to take up cycling, particularly in areas without an established cycling culture. To the contrary, in their review Pucher et al. (2010) found many studies showing positive associations between interventions and levels of cycling. However, they note that there is no evidence on direction of causality and it is thus unclear whether infrastructural or policy changes led to increased cycling levels, or vice versa, and that the same infrastructure provision, program, or policy might have different impacts on cycling in different contexts (Pucher et al. 2010).

A review by Arnott et al. (2014) on 27 behavioural interventions (that lasted from 1 week to 24 weeks) suggests that there is no evidence on the efficacy of interventions in decreasing the frequency of car use. The finding is supported by a review of 77 behavioural interventions by Graham-Rowe et al. (2011), as well as Redman's et al. (2013) review on 74 studies of public transport improvements. Results indicate that interventions, such as free travel cards, encourage bus use in the short term, but the effects are not maintained when the incentives are removed. For example Fujii and Kitamura (2003) and Thøgersen (2009; also Thøgersen & Møller 2008) conducted studies on the impact of a free travel card on total 396 car users in Kyoto and Copenhagen. In both cases, the intervention succeeded in attracting car users

to use public transportation, but post-intervention, the participants did not use public transportation more than control subjects (Thøgersen 2009). Hindrances to using public transportation are related to, for instance, access to a car as well as the underlying motivations for using private vehicles. A meta-analysis by Graham-Rowe et al. (2011) found that more effective interventions included those that targeted people who have just moved residence, drivers with a strong driving habit or strong moral motivation to reduce car use, and relocating employees to reduce commuting time.

From outside the behavioural interventions framework, Sahakian and Wilhite (2014) have suggested that disruptions in particular elements of practices are one opportunity to change practices. The role of ruptures, or “moments of change”, has been investigated in several consumption domains. The best results have been obtained in attempts to change personal mobility patterns (Laakso 2017c; Schäefer et al. 2012; Thompson et al. 2011; Thøgersen 2009). For example, when people move to a new locality, support such as free public transport tickets in conjunction with tailored advice has served to promote modal shift toward public transport. Habit disruptions have been found to provide an important “window of opportunity” to change behaviour, but the extent of such change is likely to be limited without adjustments to the cultural and structural factors (e.g. Laakso 2017c; Thøgersen 2012). Moreover, as Thompson et al. (2011) point out, whereas it is possible to make use of naturally occurring ruptures, it might not be feasible or acceptable to intentionally create such ruptures.

## 4.2 CONTEXT DEPENDENCE

Since the quantitative research on behavioural interventions draws on (quasi-)experimental psychology, it is not surprising that there is limited research on the context dependence of findings, as this line of research aims to uncover universal features of behaviour and ideally excludes the impact of context through an experimental design involving a control group. However, the research that does exist is suggestive.

The focus of a meta-analysis by Delmas et al. (2013) is not on contextual factors (i.e., geographical or social contexts), but the study suggests they play a role in the findings. The standard deviation of the total effect size across these studies is relatively high, 10.0 (compared to the savings effect of 7.4%). Delmas et al. (2013) only explored the impact of two contextual factors: of these, socio-demographic factors (income, education, etc.) were a significant explanatory factor for the observed total effect size, as well as for the individual effects of energy audits, monetary incentives and individual usage feedback. This can be interpreted to imply that people who are likely to be concerned about high electricity usage due to e.g. large bills or environmental concerns, and perhaps people who have the means and opportunity to invest in energy saving measures, are more responsive than average to these interventions. The results make sense and show how pointless it is to examine the impacts of savings, for example, without considering their share in total household expenditure. In a similar vein, energy audits, for example, are probably not even offered to people who do not have the circumstances to take action.

Research also suggests that attitudes (and hence, information-based interventions) have a different impact on behaviour in different types of countries. Morren and Grinstein (2016) conducted a meta-analysis of determinants of behaviour based on 66 published studies from 28 countries, looking at studies testing a commonly used model, the theory of planned behaviour (TPB), i.e., not an intervention in itself, but a model often used to guide interventions. They categorised countries according to level of economic development, the UN Human Development Index and collectivism-individualism (World Values Survey). Since most of the studies are from OECD countries, this categorisation is perhaps not the best, but it rendered some suggestive findings. Unsurprisingly, attitudes and intentions predict behaviour better in economically developed and individualistic countries (e.g. in Europe, Switzerland, the Netherlands, Denmark) than in more collectivist and less-developed countries. This is not surprising since the attitude construct is based on assumptions of teleological and individually driven behaviour. In contrast, social norms were found to be predictive of behaviour across the diverse contexts (i.e., in both individualistic and collectivistic countries).

Another contextual issue likely to influence people's responses to residential energy interventions is orientation toward the home. For example, Thøgersen (2017) has investigated European housing-related lifestyle segments in terms of energy saving behaviour and openness to new energy-saving innovations. The lifestyle segmentation is based on attitudes toward the home, shopping, DIY, family, and privacy, etc.). Thøgersen (2017) found that the segments "enthusiastic homemakers" and "engaged homemakers" were the most focused on energy saving in the home, while the "careless dwellers" were the least focused. "Engaged" and "enthusiastic" dwellers are more common in South European countries (in the sample, Italy and Spain), and they are more likely to own their homes (home ownership in these countries is very high). The large European countries (unsurprisingly, given the method) are overrepresented in the mid-segments ("basic dwellers" and "average dwellers"), whereas North European countries (in the sample, Denmark and Finland) are overrepresented in the "basic" and "careless" dwellers category, with little interest in the home and with the smallest likelihood of home ownership. Apart from the differences between countries, this study suggests that interest in the home and home ownership can be an important factor influencing how likely people are to change energy practices related to the home. People who spend a large share of their time outside the home might not respond to energy saving interventions due to limited time and attention.

Going deeper into potential differences within country contexts, there is some evidence on the conditionality of particular interventions. Drawing on qualitative insights from experienced practitioners, Backhaus and Heiskanen (2009) highlight some of the uncertainties and context-dependencies of some of the most commonly applied interventions. A sample of these are displayed in Table 5. They show several kinds of contextual considerations that can influence whether or not an intervention is likely to be effective in a given context.

*Table 5. Uncertainties and context-dependencies of commonly applied interventions (Backhaus & Heiskanen 2009).*

| Type of intervention | Comments from experienced practitioners |
|---|---|
| Building on ongoing change processes ("moments of change") | May be useful in some situations, but ongoing change situations can also be stressful for participants |
| Changing the users' environment (e.g. use of prompts) | Works when the target group is willing to change. But prompts, for example, can lose value with familiarity and can be annoying |
| Feedback | Works when people have the opportunity to change and the information is not too overloading |
| Commitment and goal-setting | Works when goals are clear, agreed on in society and measurable and when frequent feedback is available |
| Competitions | Works when rules are fair and when groups of people (rather than individuals) compete with each other. Danger of dissatisfaction, might not promote long-term change |
| Peer-to-peer communications | Works when participant group is fairly homogeneous and trusts each other. Sometimes it may be difficult to do this in practice or to monitor whether the message gets through |
| Social support and social pressure | Requires good understanding of social dynamics – who influences whom? May be difficult to manage in practice |
| Engagement of stakeholders (e.g. "gatekeepers" like shopkeepers) | Useful when end-users are very dependent on stakeholders; requires real win-win situations and alignment of stakeholder interests |

Qualitative research also suggests that different kinds of interventions might be culturally appropriate in different countries. Heintze et al. (2015) conducted focus groups with students in the UK and Germany. While motivations for saving energy in both countries were similar and focused on extrinsic motivations such as saving money, the authors found German students to be more responsive to environmental appeals, more knowledgeable about energy conservation and more willing to accept e.g. rewards and punishments for energy saving performance. Students in both countries favoured technology-led energy interventions (e.g. apps providing reminders) but the authors conclude that these might not be effective on their own in countries (like the UK) where overall knowledge about energy saving is low.

Moreover, the effectiveness of various interventions might depend on the status quo existing in the context. As an example, historical and comparative feedback on electricity and gas use (e.g. in billing information) has been mandated by the Energy Efficiency Directive (2012/27/EU) and is being rolled out in Europe. If people already receive frequent feedback on their consumption, the impact of additional feedback might be limited. More broadly, Lehner et al. (2016) have suggested that behavioural economics interventions might be less effective in countries where the state has traditionally intervened fairly frequently in citizens' lives (e.g. the Nordic welfare states) than in countries where individuals have more choice (and hence, more opportunities to "make mistakes" i.e., make choices perceived to be in opposition to their own interests).

While experimental research and behavioural theory can offer relevant insights, it is not self-evident how to apply these insights, and some insights might have low ecological validity (i.e., they may not be relevant in the actual context of implementation). One example are the

problems observed with one of the psychologists' favourite interventions, commitments. According to Lokhorst et al. (2016), few studies report on how they include or exclude people who refused to make a commitment in their analysis. Where only volunteers are included, it is clear that the ecological validity of commitment-making (as a policy instrument) is low. These kinds of examples show how all phases of an intervention (preparation, design, implementation and evaluation) require an equal amount of attention (Dahlblom et al. 2014). As another example, some of the experimental research might not focus on the most pressing energy problems from a climate perspective, but rather select ones that are relatively easy to study experimentally in order to contribute to research on a particular psychological construct.

Šćepanović et al. (2017) have conducted a systematic review on the role of context in residential energy interventions, based on 189 reported studies. They investigated four categories of contextual factors: physical environment, socioeconomic, cultural and political/governmental. They found that the interventions that worked best across *physical environments* related to gamification and rewards. Most other types of interventions were quite sensitive to contextual features of the physical environment. The most common adverse contextual factor within the physical environment related to tenure of the residence: participants in rented homes were most often less likely to respond to all kinds of commonly used interventions, particularly audits and support for retrofits. In terms of *socioeconomic contexts*, the interventions that were most independent of context included communication on co-benefits of energy saving, social norms, commitment and goal-setting. On the other hand, they found that low-income and vulnerable households are likely to respond to interventions differently from other groups. *Cultural factors* were found to be most widely discussed in empirical studies: communication about co-benefits, goal-setting and social norms were found to work relatively well independently of cultural context, and Šćepanović et al. (2017) also suggest that concrete visualisations and well-designed social energy apps might work across cultural contexts. They also suggest that interventions might clash with the cultural context if participants are concerned that their comfort, lifestyles and habits are threatened. In terms of *political and governmental factors*, gamification and rewards, communication on energy conservation co-benefits, goal-setting and commitment were found to perform relatively well across contexts. Unsurprisingly, audits and support for retrofits were found to gain support from favourable political contexts, whereas several types of interventions were found to be easily undermined by the political conservativism of participants and by unsupportive energy utilities.

Mourik et al. (2009) conducted a meta-analysis of 27 case studies focusing on conditions explaining success and failure (in terms of efficiency, effectiveness and learning) of demand-side management programmes (i.e., financial instruments, energy service companies, energy performance contracting, third party finance, general information and education campaigns, metering and feedback, energy audits, energy advice, negotiated agreements, voluntary programmes and commitments, and urban multi-stakeholder programmes, or a combination of these) in various EU countries, with a special focus on the role of context, timing and actors. Their findings stress the importance of interaction and learning in order to arrive at programmes which 'fit' the context in which they are embedded. Furthermore, the results highlight the need to account for the context of the energy intermediaries

delivering the programmes as these actors are embedded in their own context which exerts influence on the programme as well. Developing a comprehensive understanding of context is acknowledged to be a difficult and complex task, but one which can contribute to designing programmes bringing about lasting change.

Less systematic and more contextualised reviews have been produced by e.g. Moloney et al. (2010) and the EEA (2013). For example, the EEA (2013) identifies structural factors in the energy supply industry which may either assist in or hinder the delivery and effectiveness of behaviour change interventions, such as dynamic pricing, tariff structures and distributed generation (i.e., micro-generation by households). Moloney et al. (2010) place the behaviour change interventions in the context of communities and systems, identifying the importance of framing behaviour and social practices, exploring reasons why participants might develop commitment to participate, exploring how interventions influence participants' empowerment and agency, and how they should be placed in a framework of broader systemic change.

To conclude this chapter, it seems clear that even though experimental research suggests that there are effective interventions, the picture becomes more mixed when considering the meta-analytical evidence. Even if there are (in aggregate) effective interventions like commitments and feedback, few interventions invariably have statistically significant effects on energy consumption. Slightly stronger effects are gained when considering combinations of interventions. It seems reasonable to argue that at least part of the variability is because intervention impact is most often context-dependent (Pawson & Tilley 1997). Additionally, material, institutional and social aspects of various kinds of energy use and related practices play a large role in terms of whether and how people can 'act' on proposed interventions, meaning that agency is embedded in and influenced by larger scale institutional, material and social conditions.

# 5 APPROACHES FOR IDENTIFYING CROSS-CULTURAL INTERVENTIONS

Recent years have seen a strong shift towards 'evidence-based' policy, programmes and change initiatives. This movement emphasises that the design of social programmes or interventions should not be determined by policy makers' or programme managers' assumptions, preferences or habits, but that designs should be based on scientific evidence. In the context of promoting sustainable household energy use, this means that meta-analyses and randomised control trials are increasingly used as a basis for designing interventions. We provide examples of relevant studies in Chapter 4.

An evidence-based approach can provide significant improvements to policy effectiveness, as compared with an approach drawing on simplified assumptions of economic rationality, for example. The growing interest in behavioural science approaches highlights the importance of testing interventions and basing intervention design on empirical evidence of effectiveness (Jowell 2003). Yet, if we were to draw merely on meta-analyses and experimental evidence, we would be assuming that the success of interventions is independent of context, and that their effectiveness is universal – and we might be reinforcing the prevailing normalities maintaining the prevalent practices. The focus of the ENERGISE project on practice cultures and energy use suggests the opposite: the effectiveness of particular designs and interventions is strongly dependent on local configurations of practices and practice architectures (Kemmis et al. 2014). There is also a growing body of research suggesting that this is indeed the case (Bamberg et al. 2007; Jensen 2017c; Kuijer 2014; Nye & Hargreaves 2010), and calling for cross-case learning from initiatives (Luederitz et al. 2016). In order to better take into consideration the local conditions and configurations of practices, it is also important to be able to recognise the practices within which the people involved in the intervention 'act within' and thus what they seek to be the method as well as target of intervention. Therefore, in this chapter, we aim to find methods to uncover researchers' and practitioners' views on the role of contexts and change mechanisms in sustainable change initiatives, and to elaborate a process for the identification of practice-theoretically inspired interventions aimed at reducing domestic energy use.

## 5.1 THEORY-BASED EVALUATION AS A WAY TO CAPTURE BOTH EXPLICIT AND TACIT KNOWLEDGE ABOUT INTERVENTIONS

Realistic evaluation is a method that explicitly recognises the importance of context in making an intervention work (Pawson & Tilley 1997). By *context*, Pawson and Tilley (1997) mean not only spatial, geographical or institutional locations (such as particular countries or towns) but also the prior sets of social rules, norms, values and sets of social relationships pre-existing the introduction of the intervention. Further, the relation between interventions and contexts is complex and emergent (Dahler-Larsen 2001): interventions change the context (that is indeed their purpose), but such changes can feed back on the intervention effects. Following Dahler-Larsen (2001) we thus define context not only as the pre-existing

conditions that influence the outcomes of the intervention, but also as emergent conditions that are created by the intervention and then influence later outcomes of the intervention (see below for examples).

Realistic evaluation thus recognises the dependence of intervention outcomes on both the type of 'mechanism' (or intervention) that is used to transform practices, and the context (Pawson & Tilley 1997). It also acknowledges the role of researchers and other stakeholders as implementers of the chosen methodologies in the intervention outcomes. Realistic evaluation differs from positivist evidence-based policy by acknowledging that the context is central to the outcome of the intervention. It aims to uncover the relationship between the 'mechanism' that the programme aims to test and a certain 'outcome' in different 'contexts' (Figure 16), recognising that 'mechanisms' work differently in different contexts, and that the context can be part of the reason why a particular initiative or project works (Pawson & Tilley 1997). It also helps in locating the researchers, organisations and other implementers of the mechanisms in relation to the context. Revealing these factors and their role for the certain outcome is important not only for understanding the outcomes within different contexts, but also for the transferability of projects and initiatives.

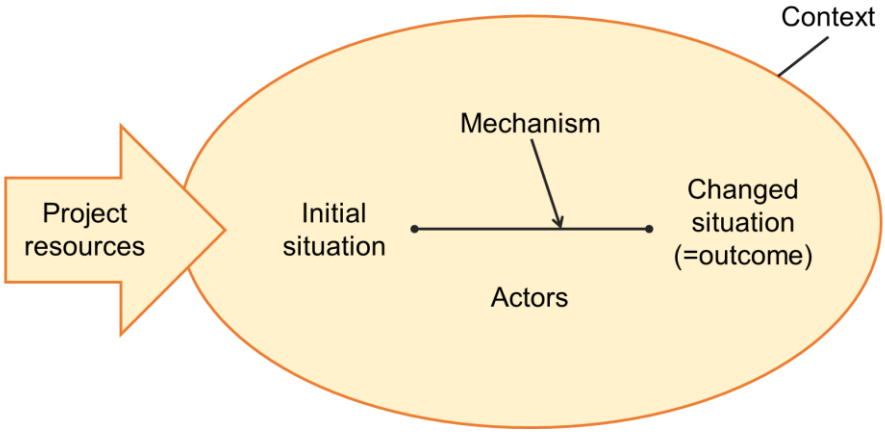



*Figure 16. Elements of realist evaluation (modified from Pawson & Tilley 2007).*

However, realistic evaluation struggles with the fact that stakeholders' views on an intervention may also influence the trajectory and outcome of the intervention. For example, Dahler-Larsen (2001) discussed how programmes can create enthusiasm and support in their context and be successful even if the underlying mechanism tested does not work ("magic programmes") or conversely, change the context in ways that undermine the working of sound mechanisms ("tragic programmes"). This is because programmes can modify their context: for example, by undermining the confidence of participants, or by creating a 'positive spin' surrounding the programme. Thus, in practice, the 'mechanism' that an intervention aims to test cannot be separated from its 'context' (Dahler-Larsen 2001).

Understanding interventions in context is a strong focus in the Theories of Change (ToC) approach, which has some similarities and some key differences to realistic evaluation

(Blamey & Mackenzie 2007)[6]. In the USA, where the approach was originally developed, ToC has also been used to design complex social programmes, with researchers working alongside practitioners (Mason & Barnes 2007). The roles of researchers and practitioners, and the focus on design vs. evaluation vary in different versions of the ToC approach. Yet a core conceptual tenet is the importance of programme theory (i.e., participants' understanding of what they hope to achieve, and how and why the programme is expected to work, both in terms of intervention mechanisms and contextual features). A core methodological approach is the articulation of participants' theories of change, or views and concepts about how change happens, which are based on personal beliefs, assumptions and perceptions of reality (Van Es et al. 2015). This is done by interviewing participants to access their views on long, medium and short term outcomes, actions and activities planned, and how and why actions are considered likely to lead to outcomes in the particular context of the programme. Structured ToCs are checked back with participants and sometimes also compared to emerging programme developments (Blamey & McKenzie 2007; Mason & Barnes 2007).

While there are different conceptual approaches, Mason and Barnes (2007) advocate for a constructivist view on ToCs. ToCs are not pre-existing, merely to be uncovered, but are actually actively constructed out of various sources and resources in attempts to understand how and why an intervention works or does not work in a particular context. This approach allows analysts to reveal different, perhaps conflicting influences on change strategies and activities, by constructing narratives of implementation and its consequences. Based on such narratives, analysts can structure the approach to change in various initiatives, design data collection methods and refine questions, as well as suggest contextually embedded explanations for achievements and problems. This approach thus iteratively combines the experiential knowledge of those involved in the implementation of initiatives with more formal logical analysis and scientific evidence, and thus offers a knowledge-building (rather than evidence-based) approach to analysing programmes and initiatives for change.

The ToC approach appears fitting for uncovering interventions that might work across practice cultures, because it is sensitive both to context and to the co-evolution of intervention mechanisms and contexts. However, our analysis also draws on other evaluation approaches, such as realistic evaluation, to arrive at our conclusions concerning interventions and their applicability across European practice cultures.

[6] In this particular literature, the term 'theory' is used in a non-standard way to refer not only to scientific, but also to everyday theories of programme participants, i.e., to the rationales or logics that bind different programme resources, activities and outcomes together. Thus, the concept of 'Theories of Change' refers to assumptions about *why* a particular (set of) instrument(s) works in a particular context, whereas 'Paradigms of Change' refer to assumptions on *how* and what kind of change takes place (i.e., is the change mechanistic, deterministic, constructivist or emergent, for instance). In other words, ToCs can be seen as empirical (and performative) manifestations that are constructed and expressed by participants, and that reveal underlying and often implicit Paradigms of Change.

## 5.2 METHODS AND DATA SOURCES

Data for designing cross-cultural interventions specifically for ENERGISE has been collected from each ENERGISE project partner and local expert practitioners, as well as from previous research. Figure 17 shows the sources of data used for identifying cross-cultural interventions in the ENERGISE project.

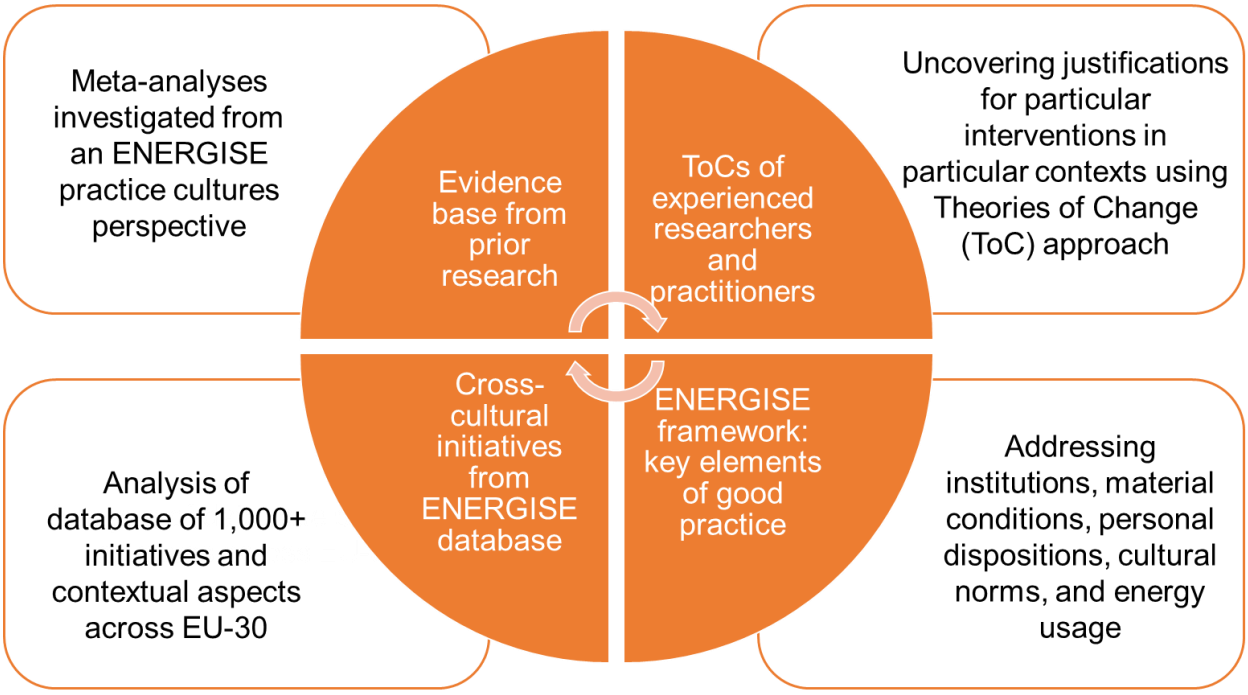



*Figure 17. Sources of data used for capturing cross-cultural interventions in the ENERGISE project.*

In identifying project partners' ToCs, we draw on a modified version of the approach to uncovering presented by Mason and Barnes (2007), and collect and analyse intervention organisers'/stakeholders' views on:

- The needs of the target group
- The long-term aims and expected time when they might be reached
- The context within which they are working: local/national, policy/practice
- The activities they are putting in place to address these needs and which will lead to expected outcomes
- The rationale for each activity – why these activities address needs and are expected to lead to outcomes in the context
- The short- and medium-term outcomes that are expected to lead to long-term outcomes

This approach, originally used for theory-based evaluation of ongoing projects, allows us to uncover some of the ways in which experienced researchers and local expert practitioners view contextual dynamics, and in particular, the influence of national, local and target group

specific energy cultures on the functioning of particular intervention mechanisms and combinations. For our ToC analysis, we collected our data from (a) eight partners of the ENERGISE consortium, comprising experienced researchers from several European countries, (b) 40 interviews with experienced practitioners working in each of the eight countries, and (c) a workshop organised for both ENERGISE consortium members (n= 19) and members of an expert panel including experienced practitioners and policy makers (n= 6).

The process of data collection proceeded as follows:

1. Partners were asked to identify and describe hard-to-reach and prioritised target groups for their country.
2. While collecting data for ENERGISE WP2 on case studies of relevant change initiatives related to energy, partners were also asked to identify three existing cases that they would expect would work in their country for their target group, as well as three cases they expected would not work in this context, and explain why. This rendered a selection of 16 initiatives (or types of initiatives) that were considered likely to work in several contexts, and justifications for these choices.
3. Partners were asked to collect feedback from at least three expert practitioners in their country on their selection and justifications, and make careful notes or recordings of this feedback (see Appendix 1 for the assignment for partners covering steps 1-3).
4. From sorting and categorising the responses based on the mechanisms mentioned, five compound stories (i.e., basic categories of initiatives, their basic assumptions, mechanisms and constraints) that would work in different contexts were created, as well as four categories of initiatives that would not work in a particular context.
5. Results have been subjected to discussion, validation and further elaboration by the ENERGISE Expert Panel and project partners in a workshop.
6. The responses and feedback have been analysed using the framework described by Mason and Barnes (2007) to uncover the ENERGISE partners' ToCs, i.e., their understanding of why particular mechanisms work in particular contexts (and others do not).
7. The outcomes of this process have been complemented with a comprehensive analysis, using the ENERGISE conceptual framework to analyse (a) features of European practice cultures that influence the effectiveness of particular interventions and (b) published meta-analyses of interventions (including identified differences, i.e., context-dependencies, in interventions).
8. The results have been further assessed and elaborated by drawing on ENERGISE D2.2, Identification of key success factors and related indicators.

This process has rendered a selection of aspects of change initiatives that (a) are likely to be cross-culturally good practices, (b) are not likely to work across European energy cultures and (c) require further investigation as to their cross-cultural applicability, as well as relevant theory-based justifications for these.

# 6 INITIATIVES IN THE LIGHT OF THE ENERGISE FRAMEWORK

In order to identify interventions (or packages of interventions) that stand a good chance of working across European country contexts, and are hence viable for further testing in the ENERGISE Living Labs, this report has investigated prior research on reasons for variations in several energy related practices in different domains (home heating, domestic hot water use, lighting and use of appliances, and mobility), as well as previous research on the influence of material, institutional, social and organisational aspects of the effectiveness of energy saving initiatives. This chapter builds on these findings, as well as an analysis drawing on researchers' and practitioners' theories of change and a database of sustainable energy consumption initiatives, to identify interventions that are likely to work across a wide range of contexts[7].

## 6.1 ENERGISE SUSTAINABLE ENERGY CONSUMPTION INITIATIVES

ENERGISE WP2 has led an extensive collection of programmes and initiatives for sustainable energy consumption in 30 countries across Europe. This has produced a catalogue of 1067 sustainable energy consumption initiatives on local, regional, national and cross-national scales (Jensen 2017a). The focus has been on initiatives that include an active involvement of households in changing energy consumption practices and engaging in energy production individually or collectively.

On the basis of this catalogue, a second phase of exploring a selection of sustainable energy consumption initiatives was undertaken (Jensen 2017b). This second phase focused on the material, discursive and social dynamics of the selected sustainable energy consumption initiatives. Cases for this more detailed analysis were selected so as to include diverse cases, creative initiatives that could inspire the design of best practice cross-cultural interventions, as well as initiatives that involve a strong practice element. These initiatives are described in terms of:

- Methods for initiative
- Steps of implementation
- Results and outcomes
- The role of the households
- Significant features of the location influencing design and implementation
- Success of the initiative
- Textual and communicative aspects of the initiative
- Physical and technological aspects of the initiative

[7] This chapter builds on a draft article 'Uncovering theories of change to design and evaluate cross-cultural real-world laboratories' (Heiskanen et al. *forthcoming*).

- Shared understandings related to the initiative
- Problem framing and target of the initiative, in terms of the matrix by Spurling et al. (2013)

A total of 81 initiatives were analysed on the basis of this framework (1-5 per country). This analysis has provided insight into (1) what kinds of initiatives have been undertaken with some extent of success across several European practice cultures, (2) how and why particular initiatives arise and produce particular kinds of results in particular practice cultures. Moreover, these analyses were used to explore (3) what are underlying basic mechanisms in relation to changing practices among the most common types of initiatives and (4) how these mechanisms depend on context (prevailing practice cultures, as well as the relationship between those implementing and those targeted by the initiatives).

## 6.2 WHAT KIND OF INITIATIVES MIGHT (AND MIGHT NOT) WORK?

When conducting interventions, thinking about change is based on multiple assumptions about what triggers change – assumptions about how change processes 'work', about the context in which it takes place and about what will happen as a result of interventions (Van Es et al. 2015). While collecting data for WP2 on case studies of relevant change initiatives related to energy, partners were thus asked to identify three existing cases that they would feel would work in their country for their target group, as well as three cases they felt would not work in this context, and *explain why*. Partners were also asked to collect feedback from at least three expert practitioners in their country on their selection and justifications.

From sorting and categorising the responses based on the mechanisms mentioned, five compound stories (i.e., basic categories of initiatives, their basic assumptions, mechanisms and constraints) that might work in different contexts were created, as well as four categories of initiatives that might not work in a particular context (Table 6). The categories are somewhat overlapping, but refer to particular foci of initiatives aiming to influence energy use in real-world settings. Also the underlying mechanisms are somewhat different.

*Table 6. Categories of initiatives that might (or might not) work in changing household energy use (Heiskanen et al. forthcoming).*

| Category | Description | Example |
|---|---|---|
| **Might work** | | |
| Needs-based tailored support | Packages of measures (tools, technical support advice) that are adapted to address specific barriers to more sustainable practices in the target group | Project ZERO, Sønderborg, Denmark: Households received a free energy consultation in their homes, where improvement opportunities were identified, costs discussed and an action plan defined. Homeowners were connected with qualified craftsmen and banks for finance |
| Pioneers | Volunteer households are selected to try out new, more sustainable practices, supported by measures to create awareness, competence and offer new materials | Future Households, Finland: Five households tested new products and services for one month's time while aiming to cut down their carbon footprints. They were supported by individual roadmaps towards sustainable carbon footprints and related measures. |
| Learning by doing | Households are engaged through (often low-cost) devices or 'kits' for metering/controlling energy use, or DIY materials and instructions for insulation or other improvements | DIY insulation workshops, Energiaklub, Hungary: Households were able to rent tools for insulating doors and windows to reduce energy loss due to poor insulation, and thus reduce energy costs. Networks of NGOs provided instructions. |
| Challenge, competition, game | Households are engaged by turning energy use into a competition or game where people attempt to e.g. save as much energy as possible | Student Energy Race, Duwo, the Netherlands: Student houses compete for who can save the most energy. The student housing that saves the most energy on a percentage basis wins a prize |
| Peer-to-peer learning | Peer advisors are engaged to demonstrate and spread good practices in sustainable energy use within their community | Open Home Energy Walks, Finland: Residents with progressive energy solutions are selected as visit points in a collective walk, with opportunities to view installations and usage, ask questions and learn how users have adapted their practices |
| **Might not work** | | |
| Complex technological interventions | Initiatives that solely rely on technological improvements, require coordination with/ altering of current planning systems, energy provision infrastructures or energy policy | In Ireland, for example, there are few multi-family houses and existing infrastructures would make the successful development of district heating problematic from a cultural and a technical perspective |
| Too extreme vis-à-vis problem awareness | Measures seen as disproportionate to the (perceived) scale of the problem or competitions focusing solely on energy saving (risk of some people "going overboard") | A competition for 'Energy Experts' (local activists) in Finland: Eager participants went overboard and closed down common saunas and removed fuses to win competition – with which other residents were naturally annoyed |
| Very general focus | Initiatives that on a large scale work to create buzz, but wouldn't actually save energy as they are diffuse in focus and lack of proper funding, concrete targets or target groups, or monitoring | Manchester is My Planet pledge campaign, UK: The pledge campaign dominated the wider MIMP programme and for many citizens MIMP = the pledge campaign. However, the pledge campaign did not engage people to act and the impacts of the campaign remained modest |
| Incompatible with infrastructure/ practices | Initiatives that require or assume infrastructure that is not available locally, or practices that are not customary | In e.g. Finland, home-related DIY for apartment buildings does not work in rental apartments, as tenants are often not allowed to make repairs. Also initiatives relying on individual heat metering in apartment buildings wouldn't work in Finland |

While the 'needs-based, tailored support' category aims to adapt energy saving opportunities to existing practices (see e.g. Schubert 2016), the 'pioneers' and 'challenge' categories aim to challenge existing practices by creating a temporary time and space where established practices can be provisionally disrupted to facilitate individual and collective learning about new practices. The difference between these two, in turn, is that in the 'pioneers' category, the crafting of new practices is placed centrally, often with the aim to develop new products and services. Pioneers, such as Climate families in e.g. Denmark and Finland, are voluntary citizens whose sustainable lifestyle trial is aided with the help of the experts, and followed by the peers from local media, television and/or internet pages. 'Needs-based, tailored support' and 'pioneers' could involve metering, feedback or calculations of savings, whereas the 'pioneers' category was seen to entail an effort to create new services and solutions rather than simply quantitatively reduce energy use. It was thus considered to offer greater opportunity for change, as well as greater attraction for participants. Challenges and competitions, in turn, leave the development of new practices up to participants, and often only measure the outcomes in terms of energy saved. An important aspect was the innovative and transformative potential of different types of mechanisms in interventions, and the opportunity to contest some norms that might be hard to discuss, such as cleanliness.

The last two 'might work' categories build on widespread concepts in non-formal education, for example, the category 'learning by doing' builds on an old adage about human learning processes. Yet it is the material engagement with new tools (such as 'energy saving kits'[8]), and the performance of actions like metering or small home repairs, which is expected to serve as an entry point for broader (often unspecified, or diverse) learning processes, including empowerment of participants and the development of new identities as energy-aware citizens due to gaining new skills and competences. In 'peer-to-peer learning', other people (peers), are the point of engagement for participants: the example they set is expected to contribute to replication, social normalisation and diffusion of more sustainable practices within the peers, also nurturing the perceptions of normality around new services and technologies.

When it comes to initiatives that might not work in particular context, the task of generating categories was somewhat more difficult, as it was not easy for partners to identify specific initiatives that have not been successful. This might relate to insufficient reporting on the "unsuccessful" initiatives or the fact that defining when an initiative is successful or not is not unambiguous, but many initiatives might have more or less successful elements (and many partners identified these elements, rather than individual initiatives). Thus the categories were limited to four: Complex technological interventions, too extreme vis-à-vis problem awareness, very general focus, and incompatible with infrastructure/ practices.

Complex technological initiatives rely solely on technological improvements and require coordination with or altering of current planning systems, current energy provision infrastructures or current energy policy. In other words, they rely on 'technical fixes' in energy efficiency (such as new smart home applications or whole districts relying on renewable

[8] See: http://www.codema.ie/think-energy-home-hub/what-is-the-home-energy-saving-kit/.

energy), rather than target the underlying practices that use energy – as one participant described, “efficient design is often not used efficiently”. This type of initiative is also related to interventions that are ‘incompatible with infrastructure and/or practices’, relying on homogenous cooling or heating systems (or needs for these systems, or opportunity to pay for these systems) or the ways e.g., housing associations are organised – or the idea of an ‘average’ household.

“Too general” initiatives refer to wide campaigns that often remain distant to households or lack the clear call for action. For instance, pledge campaigns might attract people who are already “converted” to sustainability issues, but not the hard-to-reach groups. It is also easy to “commit to anything” without these commitments leading to actual actions. Moreover, for example, “awareness days” may be visible to many people, but these people might need more advice on what they could do about the issue in question, and they may even be considered too top-down and moralistic, leading to push-backs. Without clear, measurable outcomes the funders of these initiatives may withdraw their support, or other partners may lose their interest, leading the initiative to fade away. However, these kinds of initiatives might work better in smaller municipalities that are less “anonymous”, or other places were peer support is available. On the other end, ‘too extreme’ interventions may be fruitful in challenging the prevailing norms related to e.g., cleanliness, but it might be difficult to find volunteers or for them to maintain the new practices. The message of these kind of initiatives might also be difficult to convey to different groups of people or different contexts.

## 6.3 THEORIES OF CHANGE OF EXPERIENCED RESEARCHERS AND PRACTITIONERS

The above mentioned change initiatives that might (and might not) work served as a starting point for ENERGISE Expert Panel Workshop that was organised in Dublin in May 2017. The aim of the workshop was to (a) elaborate and complement the selection of might/might not work initiatives, (b) narrow down the selection of ELL designs by discovering whether there already exists preferred initiatives across all countries that are relatively similar, and (c) also start work on WP4, initial sites and groups to be involved.

The material from the workshop, as well as from the previous assignment, have been analysed using the framework described by Mason and Barnes (2007) to uncover researchers’ and practitioners’ ToCs, i.e., their understanding of why particular aspects of change initiatives work in particular contexts and others do not. The data have been complemented with a comprehensive analysis, using the ENERGISE conceptual framework to analyse (a) features of European practice cultures that influence the effectiveness of particular interventions and (b) published meta-analyses of interventions (including identified variances, i.e., context-dependencies, in interventions). Each of the categories are to some extent generalizable, and are based on typical programme designs found in more than one country. Yet we did find context-mechanism combinations that are amenable to producing expected outcomes, and ones that were found – on the basis of the participants’ experiences, and elaborated in their ToCs – to be less amenable (Table 7).

*Table 7. Context-mechanism-outcome combinations of initiatives identified in ToCs (Heiskanen et al. forthcoming).*

| Category | Context | Mechanism | Expected outcome |
|---|---|---|---|
| Needs-based tailored support | Particularly appropriate for vulnerable groups, including low-income households, elderly, people with learning disabilities, non-nationals, but can also fit middle-class or busy parents.<br>Also implied in designs that build on 'moments of change'.<br>Opportunity to 'piggy-back' on other initiatives (e.g. community, school, social) | Identification of needs, opportunities and obstacles for energy saving specific to the participant group.<br>Focus on tailoring support on the basis of identified needs to make energy saving easy and to fit it into existing practices.<br>Engagement of supportive network of stakeholders | (a) Reduced energy demand among groups in specific circumstances and/or (b) social benefits such as reduction of fuel poverty and better living conditions |
| Pioneers | Engages volunteers, usually people with a green interest.<br>Diffusion might benefit from the involvement of celebrities, yet exemplars might preferably be similar to potential adopters.<br>Diffusion depends on the presence of interested channels (product/ service developers, media) | Challenging and reshaping social norms and existing household practices by testing and showcasing new variants.<br>Breaking barriers and finding solutions to difficult lifestyle changes.<br>Showcasing that alternative, low-carbon lifestyles are doable | New practices developed/ adopted by a small group of volunteers.<br>Information for product/ service development.<br>Impacts depend on if and how the new practices diffuse – via social networks, media or via e.g. companies and public service providers |
| Learning by doing | Requires context where there is openness for engagement in energy by lay people (e.g. not everything is managed via automation or experts).<br>Requires participants who are motivated and have basic capacity to use tools | Material engagement with meters, DIY home energy improvements or learning new ways of e.g. cooking or cleaning empower participants to become active and creates awareness of energy use | Enhanced competences and skills and permanently reduced energy use (also via spill-over to other domains than those originally targeted, e.g. other types of energy use, political activity etc.) |
| Challenge, competition game | Targets volunteers.<br>Usually applied in social context where participants recognise peers and can compete/ game on a level playing field.<br>Has been applied in diverse contexts: students, streets, etc. but might alienate some groups | Engage participants through fun, entertainment or rewards (feedback and gratification).<br>Challenge practices by creating temporary space where everyday conventions do not apply | Permanently reduced energy use through experiences gained during challenge/competition/game period |
| Peer-to-peer learning | Requires existing groups of peers underpinned by trust, familiarity and a basic sense of similarity.<br>Can be dominated by strong characters and unequal power dynamics | Social modelling via reproduction of practices, discussion and relevant exemplars.<br>Normalisation/ reshaping of what is considered normal energy-related practice.<br>Diffusion in social networks | Permanently reduced energy use via social diffusion of new practices |

The mechanisms within each category were identified as relying on different contextual conditions in order for them to work. In the category 'needs-based tailored support', the

context is the participants' *problem*, even though the nature of that problem can range from social exclusion and vulnerability, to a 'moment of change' when existing routines are disrupted. Problems can also be 'created', for example, with energy audits revealing the potential for saving energy, though our workshop participants felt that it is easier to gain engagement if people have concrete problems, for example through high fuel bills – or if energy saving could be combined with time saving solutions such as home-deliveries, making lives of busy parents easier. Nonetheless, it was generally agreed that the starting point for such interventions is a fine-grained analysis of the problem and its context, and the production of tailored solutions. Moreover, since the participants' context is typically unsupportive of resolving the problem, these initiatives aim to introduce multiple sources of support, for example, the provision of technical and financial services.

For the 'pioneers' category, ideal contextual conditions were more difficult to identify. In previous initiatives, pioneers are invariably a small group of volunteers. Participation often requires interest in disrupting practices and challenging conventions, as well as a relatively high degree of environmental motivation. Since the pioneer group is small, this type of intervention relies critically on the diffusion of lessons learned – via further development of relevant products and services, but also via some form of social diffusion, for example, by encouraging participants to share experiences in (social) media and among their peers. Both forms of dissemination suffer from uncertainty, as some people might not be keen to share their everyday experiences, or experiences reported might be of limited interest to the general public. For this reason, some initiatives in this category have sought to engage celebrities as pioneers, though it was noted that in order for the exemplars to be relevant, pioneers should be similar to those who are expected to learn from the pioneering practices. Hence, the social context surrounding the pioneers, and the settings in which new practices are developed and tested, is a critical condition for the mechanism to work.

The context on which the 'challenges' category relies is somewhat different, even though the mechanism is somewhat similar to that of the 'pioneers' category. From the outset, challenges are rolled out to a large group of participants, like students or neighbourhoods. Our workshop participants recognised that this group needs to be somewhat homogeneous in order to create a level playing field and a relevant social context for competing in, for example, energy savings achieved. Usually, no particular practices are prescribed, suggested, or even analysed. Rather, the changes in practices are implied in the changes in energy use resulting from the competition. While 'pioneers' are often seriously testing new practices, the 'challenges' category deploys an element of fun, rapid feedback and gratification from progress toward targets. This also implies certain requirements concerning the context, including communications and awards that resonate well with participants. We noted initiatives where competitions had backfired when participants had not felt engaged or inclined to compete – as was raised up in the workshop, rather than compete, it might be fruitful to collaborate together towards a declared challenge or goal.

The 'learning-by-doing' category aims to empower participants through practical engagement, but it was also found to require a context where there is room for empowerment. It was suggested that this type of intervention is most likely to engage people who already have the skills and propensity to engage with technical equipment or crafts or

willingness to engage in new ways of performing mundane practices, such as those of cooking or washing clothes. It also requires a context where there is openness for engagement in energy by lay people ('amateurs') – for example, not where there is no room for human intervention because systems are fully automated, or expert-dominated contexts where lay input is not welcomed. For example, DIY renovations might be discouraged in modern buildings controlled by facilities management experts. Individual heat metering is difficult to apply in buildings with central heating and no individual billing, as is the case in many new EU member states and the Nordic countries. In this sense, where the basic conditions for DIY engagement and related forms of energy citizenship are lacking, mere introduction of meters or tools may not be sufficient.

'Peer-to-peer learning' is – by definition – dependent on the social context. It usually requires existing communities of peers underpinned by the requisite trust, familiarity and a basic sense of similarity – thus these kind of initiatives might work better in smaller municipalities or communal districts, rather than in big cities, and within contexts in which people are willing to visit or open their doors to unknown people. Yet within the social network, there also needs to be some difference, or someone to learn from. However, it was noted that existing social networks can also be dominated by strong characters and unequal power relations, and controlling the 'message' that is diffused can be complicated. Emergent mechanisms of replication, social normalisation and diffusion are thus reliant on the compliance of participants, and on the predictability and integrity of information flows within social networks.

Our findings show that practitioners often find appropriate context-mechanism-outcome combinations intuitively, but we also found examples where measures had been applied in inappropriate contexts leading to disappointing results. Hence, we feel there is value in articulating programme theories and the context-dependence of outcomes. While academics and practitioners from all partnering countries were involved in the conversation, participants or organisations who would be most immediately affected by the programme were not included because the planning of the intervention preceded the selection of sites and target groups. This might translate in a more theoretically and generally informed type of change theory, as well as in ToCs that draw on a more diverse base of real-life experience than is usually the case. More work is also needed to better understand how to fit mechanisms to contexts and contexts to mechanisms in order to create the best pathways for scaling up sustainability change. We also recognise that complete intervention designs are much more diverse and complex than the idealised social influence intervention categories that we identified.

# 7 SUMMARY AND CONCLUSIONS: CAPTURING CROSS-CULTURAL INTERVENTIONS

ENERGISE WP3 aims to design innovative, readily replicable and scalable Living Labs and provide guidelines for practitioners. The aim of this report (D3.1) has been to identify **which kinds of interventions in energy using household practices might work in several European countries and sub-national contexts, given the differences in practice cultures between and within countries.** In order to identify interventions (or packages of interventions) that stand a good chance of working across European contexts, and are hence viable for further testing in the ENERGISE Living Labs, this report has investigated (1) prior research on reasons for variations in several energy related practices, (2) previous research on the influence of material, institutional, social and organisational aspects of the effectiveness of energy saving initiatives, (3) theoretical and methodological approaches to uncovering the role of these aspects in interventions and, (4) based on the ENERGISE database of European sustainable energy consumption initiatives, an analysis drawing on experienced researchers' and practitioners' theories of change to identify interventions that are likely to work across a wide range of contexts.

Our review of differences in energy-relevant practice cultures between and within European countries is not exhaustive. It has rather served as an example of how organisers of sustainable energy change initiatives may need to challenge their initial assumptions when designing cross-cultural initiatives. We have complemented our review with an expert-based analysis drawing on project partners' and local practitioners' views in order to gain an enhanced understanding of how the success of a sustainable energy change initiative might depend on context, i.e., the geographical, social and temporal environment of the groups engaged in the initiative. This concluding chapter presents some aspects identified as cross-culturally appropriate practice. We then identify aspects of change initiatives that are likely to be highly context-dependent, and which make the cross-cultural transfer of initiatives difficult. Finally, we identify aspects that require more research with respect to their context-dependence.

## 7.1 ASPECTS IDENTIFIED AS CROSS-CULTURALLY GOOD PRACTICE

From the perspective of environmentally relevant household practices, it would be important to target issues that really make a difference in household energy consumption. Home heating practices represent a large share of domestic energy consumption (see Figure 1, p. 10), whereas the relative role of domestic hot water is likely to grow as new and renovated buildings are more efficient in terms of space heating. People are also becoming more mobile (it is estimated that the number of passenger-kilometres will increase by about 40% between 2010 and 2050 [Eurostat 2017c]), and there is a growing need to stimulate modal shifts and to find ways to reduce mobility needs or meet them in new ways. Due to EU legislation, household appliances are increasingly energy efficient, and where consumption is growing, it is due to increases in service levels (more and larger appliances in homes). Although the environmental impacts of these practices depend to a large degree on the

ways in which energy is produced, it is nevertheless also important to focus on the underlying conventions and conditions steering these mundane practices and the ensuing energy use.

Ideally, **change initiatives should target several aspects of household energy use and several dimensions of practice cultures**, thus allowing better understanding of the interconnections between practices. Our review of European energy-relevant practice cultures (Chapter 2) shows the importance of considering material dimensions (such as infrastructure, technologies, products) alongside people's competencies, emotions, beliefs and motivations, and social context including norms and cultural prescriptions. There is individual variation which is often influenced by personal history, but at the same time practices are socially reproduced and guided by understandings and assumptions of normality and acceptability in a given context (see e.g. Halkier 2013; Laakso 2017a; Sahakian 2017). At the same time, the examples in previous chapters (such as the case on low-temperature laundry) show, everyday practices provide interesting opportunities for change initiatives (Mylan 2016). The examples also show that technology, social and individual aspects and context need to be considered in conjunction.

The ENERGISE catalogue of European sustainable energy consumption initiatives (Jensen 2017a) shows that households can engage in saving energy in the home or in personal mobility for various reasons. People can engage because of costs and attempts to lead a more decent life, environmental reasons, due to social relations or because of a desire to learn about new solutions and technologies. Some people might simply like a change or to simplify their life. Organisers of these change initiatives, as well as other stakeholders, can have different reasons and ambitions. It is obviously a good practice to be clear about the diverse expectations of different parties in change initiatives. The diversity of households' and others' expectations also gives rise to a need to consider the framings and language the initiators use, since different language can speak to different people in different ways. From a practice perspective, and when ambitions about reducing energy use are high, initiatives also need to consider how energy related needs are defined. A practice perspective offers the opportunity to look beyond existing behaviour and how to perform it more efficiently, at alternative ways to address households' needs and concerns about managing everyday life.

Our expert-based analysis of the theories of change underlying selected change initiatives served to uncover different ways in which European initiatives can work to change engrained practice cultures. We found that interventions in practice need to consider to what extent they want to support existing practice by adapting new solutions as closely as possible to the practices, and to what extent they want to challenge them. We identified three categories of sustainable energy initiatives where this balance is at stake, and which are widely used in many parts of Europe:

1. **Needs-based tailored support** is an approach that aims to *fit and adapt* new energy saving actions into existing practices, with a concern for the particular needs, opportunities and obstacles specific to the group of participants. Typically, such projects aim to introduce new competencies and meanings, while offering expert, technical and financial support.
2. **Pioneers** is an approach which aims to *challenge existing practices* by engaging households in fixed-term experimentation with new practices (e.g. new ways of showering and new understandings of cleanliness). Such experimentation is expected to provide households with experiences which support the adoption of new practices, while offering user feedback on opportunities and problems encountered in adopting new practices to product, service and infrastructure designers.
3. **Challenges, games and competitions** are another way to challenge existing practices by creating a temporary space for experimentation as well as by framing change in terms of fun, entertainment and rewards. Here, however, the practices that change are not always specified (targets are usually set in terms of energy saving, although there are some exceptions), nor are they usually analysed (so there is less feedback to organisers on the opportunities and problems encountered).

Moreover, we identified two categories of sustainable energy initiatives, also widely used across Europe, which employ different entry points to engage households:

4. **Peer-to-peer learning** is an approach for engaging households that builds on existing social relations to reshape understandings of normality. Examples are eco-homes open doors days, which have been organised in several European countries.
5. **Learning by doing** is an approach for engaging households that starts with material engagement with devices or DIY projects or experimenting with new ways of performing daily practices. These usually have a practical function and create new competence, but usually also aim to empower participants toward energy citizenship.

While we found that each category of change initiatives is more suitable for particular types of participants than others (see Chapter 6), engaged participants for each of these are likely to be found throughout Europe. Because of this, and since we were able to identify a consistent logic and each approach is supported by a body of existing research, they are likely to provide ingredients for designing change initiatives that make sense across European practice cultures.

From the perspective of transferability, it is nevertheless important to understand the context-dependence of outcomes. Each of the basic designs identified is dependent on certain contextual conditions, though such conditions might be found somewhere (but not everywhere) in each European country. An understanding of context-dependence offers a realistic view of the potential, but also the limitations, of various types of interventions. For example, the ‘challenge’ category requires a (real or imaginary) social context. Where such a context does not exist or cannot be created, the ‘challenge’ mechanism is unlikely to work. In addition, competitions can be highly successful in some situations, but can end up “going overboard” if taken too seriously. The ‘pioneers’ design has relied largely on ‘green’ motivations, openness to change, and a desire to disrupt one’s practices. If we use this design to develop solutions for more sustainable energy practices, these solutions might not

'fit' other groups in society, e.g. groups that already struggle with the disruptions brought about by economic austerity policies in Europe (who might benefit more from a 'needs-based tailored' approach). While initiatives may also want to challenge and change their context, this can be more realistically achieved when the dependency of outcomes on mechanisms, but also on contexts, is well understood.

## 7.2 ASPECTS THAT ARE MOST LIKELY CONTEXT-DEPENDENT

Every sustainable energy initiative depends on tailoring the particular measures used to the requirements of the context, but some types of interventions are more cumbersome to tailor to their context than others. Our research also identified some categories of initiatives that are less likely to travel effortlessly from one European country to another.

**Initiatives that require significant (infra)structural or institutional changes** are projects requiring coordination with or altering of current planning systems, energy provision infrastructures, energy policy or e.g. (in)formal rules. This is beyond the purvey of small-scale initiatives, since there are great differences among countries and sub-national locations (e.g. different dwelling types or tenancies) in what individual households or communities can or cannot change in their environment, due to permitting and public support practices and conventions related to the built environment. Also **initiatives that assume the presence of particular infrastructures** are likely to be less replicable across Europe. Examples include projects that require particular (individually adjustable) heating systems or systems of metering and billing. Other examples include projects that aim to change mobility patterns, relying on the availability of public transport or cycling infrastructure.

**Initiatives that do not conform to existing problem awareness in the context** might be perfectly acceptable in a certain context (place, time and set of participants) but appear too extreme in another. Awareness of different environmental and energy related problems (as well as "objective" local resource scarcities) vary across Europe and also among groups within countries. For example, awareness of the problems related to water consumption is relatively widespread in Southern Europe, but less so in countries with abundant water resources. From this perspective, some types of interventions might appear too extreme in some contexts. This could result in difficulties in engaging participants and other stakeholders in the initiative. When it comes to subnational contexts, initiatives relying on environmental awareness and commitments may end up engaging only those people who are already keen to conserve energy, whereas they might not be meaningful or persuasive for those who do not find saving energy equally urgent.

## 7.3 ASPECTS THAT WOULD REQUIRE MORE RESEARCH

As this report has shown, the diversity of interconnected practices that contribute to domestic energy use is large and each practice is an outcome of competencies, affects, beliefs, and motivations, socio-cultural contexts, as well as the material dimension of consumption (including infrastructures and technologies). There are probably aspects of implementation and aspects of context that we have not been able to recognise on the basis of the available data, and which would require more in-depth research – such as why

competitions with a similar group of participants (such as students) have worked in some contexts and not in others.

Another issue which would require more research is how to challenge escalating expectations of comfort and convenience, a topic that has been widely addressed in practice theoretical research (e.g. Shove 2003). Practice-theoretically inspired research and design has often focused on experimenting with adaptive practice of home energy use (e.g. using less water at times of scarcity, warming only the person and not the entire house). Our review of European practice cultures suggests that such adaptive practices are traditionally more common in some parts of Europe than others. For example, conventions and expectations concerning variable room temperatures are quite different in different countries. These observations suggest that experiments with adaptive practices might work in several contexts, but that adaptive home heating practices, for example, might meet with material, institutional and perceptual barriers in some countries.

Another approach to challenging escalating expectations is to explicitly focus on promoting sufficiency. Our review and catalogue of change initiatives indicated that few existing initiatives, apart from eco-villages and communities, have had an explicit aim toward sufficiency. We also found relatively few examples of how to evaluate rebound effects from efficiency gains, particularly from a practice, rather than an economic, perspective. More research is required to discover how packages of measures and contextual conditions might support a shift toward not only energy efficiency, but also sufficiency.

Disruptions in elements of practices can offer an opportunity to change household practices (Sahakian & Wilhite 2014). There are some examples where this observation has been operationalised into change initiatives targeted at people who are undergoing disruptions, such as moving to a new locality, retiring or having their first child (Thompson et al. 2014). However, the research evidence from other than mobility-related interventions is inconclusive, and it is not self-evident how this approach could be used in aims to shape sustainable energy practices in the home, in particular if such disruptions are not naturally occurring (Thompson et al. 2014).

Finally, our expert workshop rendered a number of suggestions for how to improve on our existing examples of cross-cultural interventions. For example, the concept of pioneers was extended from its current focus on pioneering households to an idea of *pioneering practices*. This is an idea to identify the most sustainable practices and attempt to promote them. Moreover, and related to ‘pioneering practices’, the concept of challenges, games and competitions was extended to an idea of supporting *competing practices* (or swapping practices). This idea suggests that instead of groups of people competing with each other to save energy, practices should compete with each other. The notion of learning by doing was inverted to an idea of *learning by undoing* as an approach to promoting sufficiency. Moreover, it was suggested that the ToC approach could be combined with other approaches, such as visioning and backcasting, to address the societal impact of change initiatives and to enhance existing approaches to sustainable energy change. These ideas hold significant potential for sustainable energy use, yet require more research into possible details of implementation.

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# APPENDIX 1

## WP3 Designing ENERGISE Living Labs – questionnaire for partners

The aim of this questionnaire is to gain relevant background data on country-relevant issues and constraints on energy efficiency/ energy saving initiatives, and to identify e.g. relevant local initiatives related to energy, prioritised target groups and potential sites for each country. This data is used for identifying cross-cultural interventions and designing ENERGISE Living Labs (ELL), together with meta-analysis of previous research, findings from WP2, and findings from Expert Panel workshop.

The aim of the questions is first to help you think about the priority issues and hard-to-reach groups in your country, then potential sites and target groups of living labs, and then, based on these ideas and keeping these contextual features in mind, to answer to the remaining questions. Please answer to the following questions from your own perspective and based on your own expertise on the area (or, if you base your ideas on some specific sources, please provide the source), and discuss the issues with your colleagues and relevant experienced practitioners in your country. The purpose of feedback is to check whether experts agree on the usefulness of certain energy initiatives, or whether they disagree. If you feel that something relevant is missing from the questionnaire, please feel free to write these issues down at the end of the questionnaire. The answers are to be updated in M9 after the in-depth reporting on relevant cases in WP2.

1. **Country-relevant issues and constraints**
   a) **How large a share (%) of household energy use in your country is due to**
      - Space heating:
      - Domestic hot water production:
      - Appliance energy use:
      - Lighting:
      - Other:
      - Year of data:

   b) **What is the share (%) of personal transport in your country?**
      - Of all transport:
      - Of total energy use:
      - Year of data:

   c) **How large a share (%) of households in your country suffer financial difficulties/ fuel poverty due to energy costs?**
      - Share:
      - Year of data:

d) **What are priority issues/target areas (3-5 issues) in reducing $CO_2$ from private households in your country from a policy perspective (e.g. reducing space heat)? If your own perspective is different, you can also provide an alternative list.**

1:
2:
3:
4:
5:

e) **What is the share (%) of different heating fuels in households in your country?**

- Natural gas:
- Coal:
- Oil:
- Biomass:
- Electricity:
- District heating:
- Other (specity):
- Other (specify):
- Year of data:

f) **What is the most common form and frequency of billing for the following items in your country (annual, quarterly, monthly, estimated or on the basis of actual consumption? Descriptions of variations and problems in measuring are welcome!**

- Electricity:
- Heating/ heating fuels:
- Year of data:

g) **Please provide a descriptive overview on the forms of metering for the following items in your country (analogue, digital – if so, in what forms and with what frequency do consumers receive metering data)?**

- Electricity:
- Heating/ heating fuels:
- Year of data:

**Please explain if some of the data is not available or understood/ reported differently in your country, or if there are e.g. contradictory perspectives on priority issues in reducing $CO_2$ from private households?**

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2. **Please name 2-4 hard-to-reach and prioritized groups in your country? For each group, please provide a brief explanation why. If there are contradictory priorities in your country, we are interested in hearing about them as well.**
   1:
   2:
   3:
   4:

3. **Please name 1-4 potential partner sites to work with and the relevant stakeholders you would be working with? Explore the pros & cons of each site.**

| 1. | |
|---|---|
| Pros | Cons |

| 2. | |
|---|---|
| Pros | Cons |

| 3. | |
|---|---|
| Pros | Cons |

| 4. | |
|---|---|
| Pros | Cons |

4. **Which types of target groups would you like to work with in the ENERGISE Living Labs (2-3 groups): Please describe the group including e.g. level of urbanization, types of dwellings, socioeconomic status, household size, demography, the level of previous knowledge about and engagement with energy saving, or other features you feel relevant?**
   1:
   2:
   3:
   4:

5. **How important a role do you envisage each of the following interventions to have in the ENERGISE Living Lab design? Please provide more items and ideas by adding rows, if you find that something is missing or emerges during the following months.**

| Intervention | very important | somewhat important | neutral | rather unimportant | completely unimportant |
|---|---|---|---|---|---|
| 1. Awareness-raising interventions (energy audits, diaries, etc.) | | | | | |
| 2. Information provision | | | | | |
| 3. Individual commitments and goal-setting | | | | | |
| 4. Collective commitments and goal-setting | | | | | |
| 5. Social influence interventions (recruitment via social networks, peer-to-peer learning: demonstrations, train-the-trainer initiatives, clubs) | | | | | |
| 6. Games, challenges, competitions | | | | | |
| 7. Co-development of technologies to reduce energy consumption (participatory design of solutions to energy problems) | | | | | |
| 8. Imagining futures, visioning, forecasting | | | | | |
| 9. Use of descriptive social norm information (i.e., information on what others are doing) | | | | | |
| 10. Energy ruptures, e.g. life changes approaches, e.g. particular services like free bus passes for people who recently moved into the area | | | | | |
| 11. Experimentation with new practices | | | | | |
| 12. Feedback from participants | | | | | |
| 13. Feedback from metering etc. | | | | | |
| 14. Feedback from other stakeholders | | | | | |
| 15. Changes to the physical environment (e.g. prompts, | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| gadgets, reorganizing the home, parking space etc.) | | | | | |
| 16. Tailored external support and services (e.g. help with managing energy bills, technical issues) | | | | | |
| 17. Engaging relevant 'gatekeepers' (e.g. service providers, facility managers, retailers) | | | | | |
| 18. Partnerships with local authorities | | | | | |
| 19. Other (specify) | | | | | |
| 20. Other (specify) | | | | | |

**For items that you indicated above as very <u>important</u>, please explain why?**

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**For items that you indicated above as rather or completely <u>unimportant</u>, please explain why?**

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6. **Please outline three potential energy initiatives (from WP2 database or elsewhere) that you feel would work in your country and for your target groups. Explain why (1/2-1 page/ intervention).**
   1:
   2:
   3:

7. **Please outline three potential energy initiatives (from WP2 database or elsewhere) that you feel would NOT work in your country and for your target groups. Explain why (1/2-1 page/ intervention).**
   1:
   2:
   3:

8. **Please present your ideas concerning points 6 and 7 to three relevant experienced practitioners in your country and ask them for feedback. Provide here a brief summary (1-2 pages) of the feedback obtained from them.**

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9. **Please describe the data collection methods used for researching initiatives mentioned above (questions 6 and 7).**

   a) **Which methods worked well and why? What positive experiences you have, what methods are useful?**

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   b) **Which methods did not work very well and why? Which methods might cause difficulties in certain contexts?**

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10. **Sustainability assessment toolkit: on the basis of your experiences from past studies, what kinds of items would you like to see in it? Please provide more issues by adding rows, if you find that something is missing.**

SAT will include baseline definition, identification of rebound and spin-off effects, social, economic and environmental output, outcome and impact measures, socio-demographic data and information about the social acceptability of the ELL.

| Intervention | very important | somewhat important | neutral | rather unimportant | completely unimportant |
|---|---|---|---|---|---|
| 1. Participant satisfaction (e.g. would participate again, would recommend to friends) | | | | | |
| 2. Stakeholder satisfaction (other than participants, e.g. city officials) | | | | | |
| 3. Changes in practices, quantitative (e.g. daily kilometres driven) | | | | | |
| 4. Changes in practices, semi-quantitative (e.g. self-reported changes in speaking about things to others, doing things differently, gaining new skills) | | | | | |
| 5. Changes in practices, qualitative (e.g. narratives) | | | | | |
| 6. Likelihood of persistence of changes | | | | | |
| 7. New networks created | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 8. New institutions formed to support changed practices | | | | | |
| 9. Reductions in home energy and fuel use | | | | | |
| 10. Cost savings | | | | | |
| 11. $CO_2$ emission reductions | | | | | |
| 12. Rebound effects | | | | | |
| 13. Unintended positive/ negative effects in e.g. wellbeing | | | | | |
| 14. Multiplication effects/ diffusion of practices | | | | | |
| 15. Spill-over effects | | | | | |
| 16. Other (specify) | | | | | |
| 17. Other (specify) | | | | | |

**11. Please provide at least one good example (e.g. web link) for a sustainability assessment tool?**

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**12. Do you know any examples of sustainability assessment tools that address spill-over or rebound effects?**

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**13. If you have any further questions, amendments, or comments, please write them down here?**

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**Thank you!**