2 Household behaviour and residential energy use

Households worldwide account for nearly a quarter of all energy use globally, with OECD household energy use responsible for 14% of all OECD carbon dioxide emissions in 2019. This chapter analyses responses from the third round of the OECD Survey on Environmental Policies and Individual Behaviour Change (EPIC) on households' residential energy use in nine OECD countries. It reviews the main energy sources used by households; their uptake of renewable and low-emissions options; and the barriers to further uptake. It also explores the extent to which households act to conserve energy, and their views on the policies that would encourage them to reduce their own energy use. Finally, it presents respondents' support for energy-related policies, including energy efficiency standards; subsidies for housing renovation, purchasing energy-efficient appliances or investing in renewable energy equipment; and energy taxes.

Key findings

- **There appears to be substantial unmet demand for low-emissions energy options, indicating scope to increase the availability and awareness of these options.** For example, 39% of respondents report that their provider has not offered the option to use electricity generated from renewable energy sources, but that they would be interested in this option if it were available. Uptake of low-emissions heating and cooling options (i.e. solar panels, heat pumps, or electricity generated from renewables) also appears to differ by housing ownership status and dwelling type, indicating some barriers to their uptake. For example, 17% of those who live in houses use low-emissions heating and cooling options versus 11% of those living in apartment buildings. Supply-side measures such as renewable energy mandates, could increase the availability of low-emissions options, while demand-side measures such as information provision and government support for the installation of equipment, could increase uptake.
- **Reducing the installation costs and increasing awareness of low-emissions energy technologies could boost their uptake.** The availability and adoption of low-emissions energy technologies could be higher. Overall, 43% of households report having installed low-emissions technologies in their household. Installation rates are highest for low-energy lightbulbs (87%), energy-efficient appliances (66%) and energy-efficient windows (58%). Of respondents for whom installation is feasible, less than a third report having installed solar panels (29%), heat pumps (30%) and battery storage (27%). Affordability and lack of awareness appear to be significant barriers to the installation of these technologies, as cited by around a fifth of respondents for whom installation is feasible. This points to the potential role of government support for installing low-emissions technologies and enhancing public awareness of these technologies. There also appears to be scope for consumers to make better use of available technologies. For example, 52% of respondents with smart meters report not using the information provided to help them optimise energy use.
- **Measures to encourage energy conservation could include providing better information on how to save energy, as well as reminders to do so.** Overall, 28% of households report that they do not frequently act to save energy, especially actions that imply higher costs, effort or discomfort. For example, while 92% often or always turn off the lights when leaving a room, 68% of respondents report often or always minimising the use of heating or cooling. Of the total number of reasons cited for not engaging more in such behaviours, 54% of reasons involve either forgetfulness, a lack of awareness and difficulty in changing one's behaviour.
- **Over 70% of respondents approve of subsidies to individuals for energy efficiency improvements, investing in renewable energy equipment, and implementing energy efficiency standards.** There is less support for taxing energy use (38%), ranging from 30% in France to 49% in Switzerland. Those expressing the greatest opposition to tax-based policy measures also indicate low environmental concern and lack of confidence in national government. These findings indicate the importance of efforts to address public concerns in the design of policy instruments (e.g. by mitigating distributional concerns) and to clarify the purpose of tax-based energy policies and the use of the revenues generated.

2.1. Introduction

The amount and type of energy consumed by the residential sector is of substantial environmental and economic consequence. In 2019, households worldwide consumed 88 million terajoules (TJ) of energy for residential uses, making up nearly a quarter of total final energy use globally (IEA, 2022[1]). This proportion ranged from 19-21% across OECD countries and has remained relatively stable over time (IEA, 2022[1]). In terms of carbon footprint, global household energy use in 2019 was responsible for 11% of global CO_2 emissions and 14% of emissions from OECD countries (IEA, 2022[1]). Households make a larger relative contribution to total energy use than to total CO_2 emissions because electricity constitutes a larger share of the energy mix in the residential sector relative to other sectors. The energy that households use for space heating, water heating and cooking can be supplied by primary energy sources such as oil products, natural gas and traditional biomass, as well as by electricity. While the use of all energy sources generates greenhouse gas emissions and local air pollution, electricity use tends to have a lower carbon footprint than primary energy sources since it can be generated by renewable energy sources such as solar and wind.

The proportion of electricity generated by renewable energy sources is expanding. In 2015, 23% of global electricity supply was generated by renewables. This figure rose to 28% in 2021 and is expected to reach 38% in 2027 (IEA, 2022[2]). However, renewable electricity generation can also have broader environmental implications, such as for local land use, and through the manufacturing, use and disposal of related equipment, such as batteries. The combination of energy sources that countries use depends on the availability of different types of sources, the amount and distribution of domestic energy demand, as well as historical, economic, environmental and geopolitical conditions.

The amount of energy that households consume is highly correlated with population and income growth. Between 1990 and 2019, household energy and electricity consumption grew at an annual rate of 1.15% and 3.1%, respectively (IEA, 2021[3]). Evidence suggests that overall energy consumption is decoupling from economic growth in many countries (OECD, 2021[4]; Guo, Li and Wei, 2021[5]). However, the growth rates above suggest that although per capita energy use in the residential sector has remained almost stable, per capita electricity consumption has continued to increase. The International Energy Agency (IEA) estimates that between 2000 and 2019, per capita demand for electricity grew at an annual rate of 1.6% (IEA, 2021[3]).[1] For OECD countries, where household access to the standard electricity grid is high, this growth was driven by the replacement of oil with electricity for heating, the addition of new electric devices and an intensified use of existing devices. Globally, growth in the demand for electricity is also driven by an increase in the number of households that have access to electricity grids. Overall, the continued increase in per capita electricity consumption suggests that energy efficiency improvements appear to be offset by increased electricity use.

A mix of technological advances, policy support measures and behavioural adjustments is therefore necessary to reduce the environmental impact of residential energy use. This will entail a shift from polluting primary energy sources to electricity to deliver residential energy needs. In tandem, electricity generation itself will also need to rely to a greater extent on renewables, a development that will depend on both increased capacity as well as increased demand by households. Household efforts to reduce energy use and install low-emissions energy technologies (e.g. energy saving appliances and battery storage) will also help to smooth electricity demand over time, further facilitating the use of renewable energy sources. A green energy transition will also be facilitated by the use of local mini- and micro-grids, as well as off-the-grid solutions aiming to improve the reliability of the supply of low-carbon electricity.

Evidence suggests that demand-side measures can effectively reduce greenhouse gas (GHG) emissions from residential energy use. Measures that reduce energy use in residential buildings, such as effective thermal insulation, renewable energy sources and energy-efficient household appliances have been found to have the highest potential (30-70%) in reducing GHG emissions from the buildings sector (Creutzig et al., 2022[6]). Behavioural and social practices specifically could contribute 15% in emissions reductions by 2050. Infrastructure changes, such as compact urban planning, reducing floor space and low carbon architectural design could reduce emissions by an estimated 20% (IPCC, 2022[7]). The potential of improving energy efficiency and increasing engagement in energy conservation to further reduce GHG emissions at relatively low costs, is not a new finding (ACEEE, 2013[8]). And while much progress has been made, accelerating behavioural change remains a challenge and key priority for urgent action on climate change and broader environmental protection.

This chapter provides an overview of the data gathered by the third OECD Survey on Environmental Policies and Individual Behaviour Change (EPIC) on household decisions related to energy use.[2] Previous rounds of the survey were implemented in 2008 and 2011. In 2022, the EPIC Survey explores:

- households' energy sources, including conventional and renewable sources, and their use of low-emissions heating and cooling
- availability, adoption and barriers to adoption of low-emissions energy technologies
- households' actions to conserve energy
- households' support for energy-related policies.

For each of these areas, the chapter uses representative country samples to analyse differences in households' behaviours and attitudes across relevant variables, such as income level, residence type and location, ownership status and level of environmental concern.

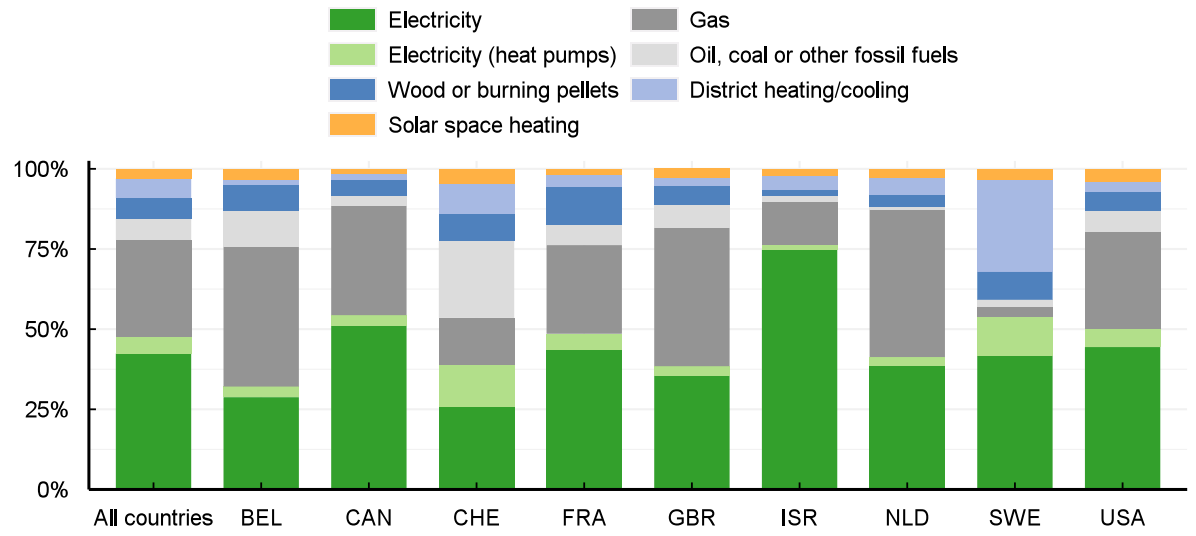
2.2. Household energy sources

2.2.1. Use of electricity vs. fossil fuels as primary energy sources

While respondents indicated using a variety of energy sources for heating and cooling their homes, the majority report either using electricity from the standard grid or gas (Figure 2.1). The highest percentage of households using electricity for heating and cooling their homes occurs in Israel. Sweden and Switzerland are characterised by a significantly higher share of households using electricity to power heat pumps for heating and cooling (11% and 12%, respectively). Apart from a slight increase in the use of heat pumps and district heating since 2011, there appear to be no significant changes in the distribution of heating and cooling systems in countries that participated in the 2011 survey (Canada, France, Israel, the Netherlands, Sweden and Switzerland) over time.[3] Overall, 12% of surveyed households report using low-emissions heating or cooling, which refers to heating or cooling that is supplied exclusively by electricity from renewable sources, heat pumps or solar energy.

Figure 2.1. Conventional electricity and gas are the main sources of space heating and cooling

Relative proportion of each response option



Note: This survey item asked respondents: "Which of the following energy sources do you use for space heating/cooling? Please select all that apply." Respondents were able to select multiple responses except when selecting "Don't know". The proportion of "other" and "don't know" responses are minimal and are not displayed in the figure.
Source: OECD (2022), Environmental Policies and Individual Behaviour Change Survey.

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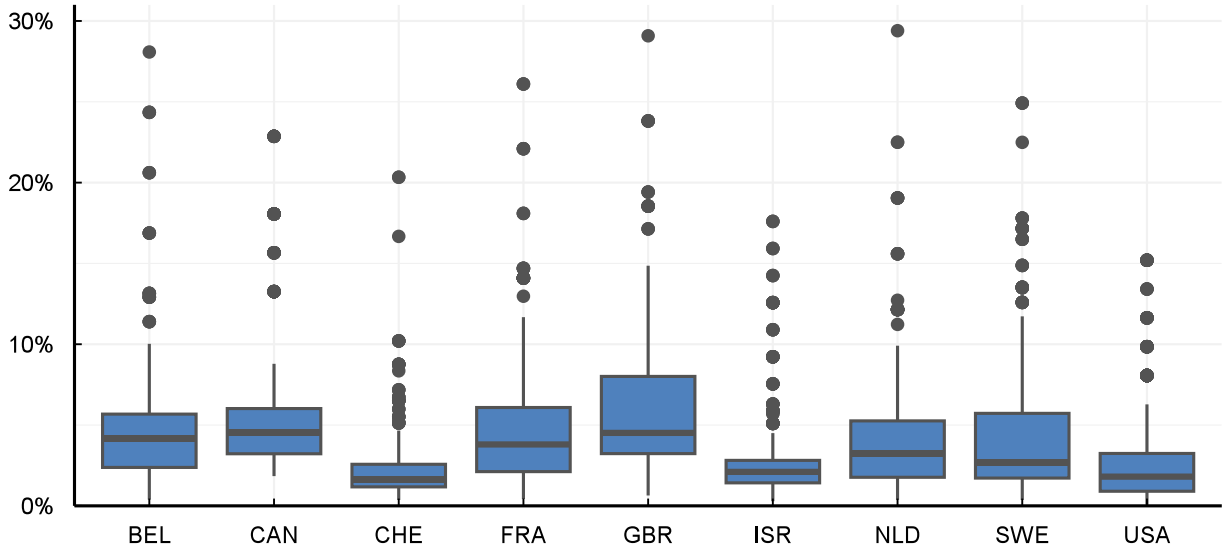
For heating water, most respondents (69%) also report using electricity from the standard grid or gas. Israel, Sweden and Switzerland are outliers. In Israel, the main energy sources for water heating are electricity (51%) and solar (30%); in Sweden, electricity (38%) and district heating and cooling (25%); and in Switzerland, electricity (30%), heat pumps (13%) or oil or coal (15%). The energy sources used for cooking exhibit less variation. Respondents in most countries report using either electricity or gas. The greatest proportion of households that report using electricity is in Switzerland (90%), while Israel has the greatest share for gas (60%).

The proportion of a household's income that is spent on electricity is indicative of their energy cost burden, especially for households that heat or cool using electricity. Electricity cost burdens in the sample range between 2% and 5% of household income, with a median of 2.8% across countries (Figure 2.2). Lowest median values are 2% for Switzerland, Israel and the United States, and the highest median value of 5% is reported in Canada and the United Kingdom. The large range evidenced by the survey data warrants further investigation into the factors that drive spending on electricity. Existing evidence suggests that electricity cost burdens can be impacted by factors such as the number of people living in the household, dwelling size, climate, energy policies, energy prices and energy-use behaviours (Durišić et al., 2020[9]). Variations in these factors will contribute to explaining variations observed at the country level.

Figure 2.2. The median electricity burden ranges from 2% to 5% across countries

Percent of net monthly income spent on electricity



Note: Each household's electricity bill burden is calculated as the average monthly electricity bill divided by average net monthly income. Horizontal lines in boxes represent from bottom to top, the 25th, 50th and 75th percentiles. The vertical lines (i.e. the "whiskers") represent minimum (bottom) and maximum (top) values (calculated as first quartile - 1.5 × interquartile range and third quartile + 1.5 × interquartile range). Dots are potential outliers. 16 outliers with values above 30% are not shown in the graph or used for the calculations of the median values.
Source: OECD (2022), Environmental Policies and Individual Behaviour Change Survey.

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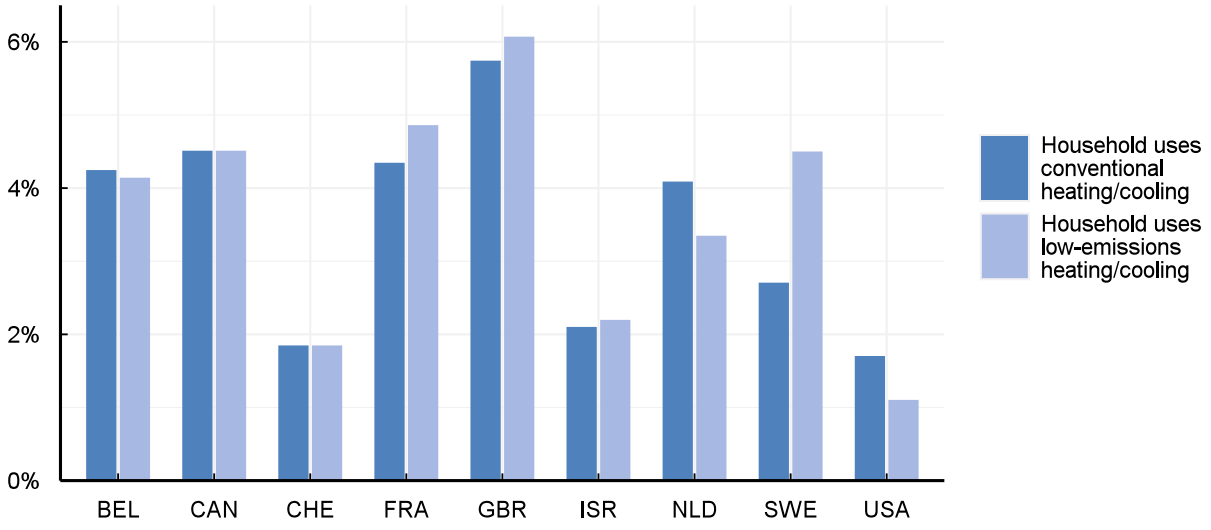
With the exception of Sweden, there appears to be little difference in overall electricity cost burdens between households that use low-emissions heating (i.e. solar space heating, heat pumps, or grid-supplied electricity generated from renewable sources) and those that use fossil-fuel based energy sources for heating (Figure 2.3). Although many factors contribute to determining electricity cost burdens, this result could suggest that the cost-related barriers to using low-emissions heating options are primarily due to the high upfront costs of installation rather than ongoing costs related to household electricity use.[4] Other differences that could be present across households that use conventional vs. low-emissions heating and cooling (e.g. differences in income) will also need to be taken into account in order to isolate the impact that low-emissions heating and cooling may have on energy cost burdens. The fact that installation costs are typically recovered over time may also explain why their use tends to be most frequently reported among homeowners rather than tenants.

Figure 2.3. The electricity cost burden of low-emissions and conventional heating is similar

Respondents' electricity bill as a percentage of income



Note: This survey item asked respondents: "How much was the average monthly cost for the electricity used by your primary residence over the past year?" Country-specific response options were provided. Each respondent's electricity bill burden is calculated as the average monthly electricity bill divided by average monthly income. Out of a total sample of 6 454 observations, 16 outliers with electricity bill burdens above 30% are excluded. Low-emissions heating/cooling includes solar space heating, heat pumps, or electricity generated from renewable sources.
Source: OECD (2022), Environmental Policies and Individual Behaviour Change Survey.

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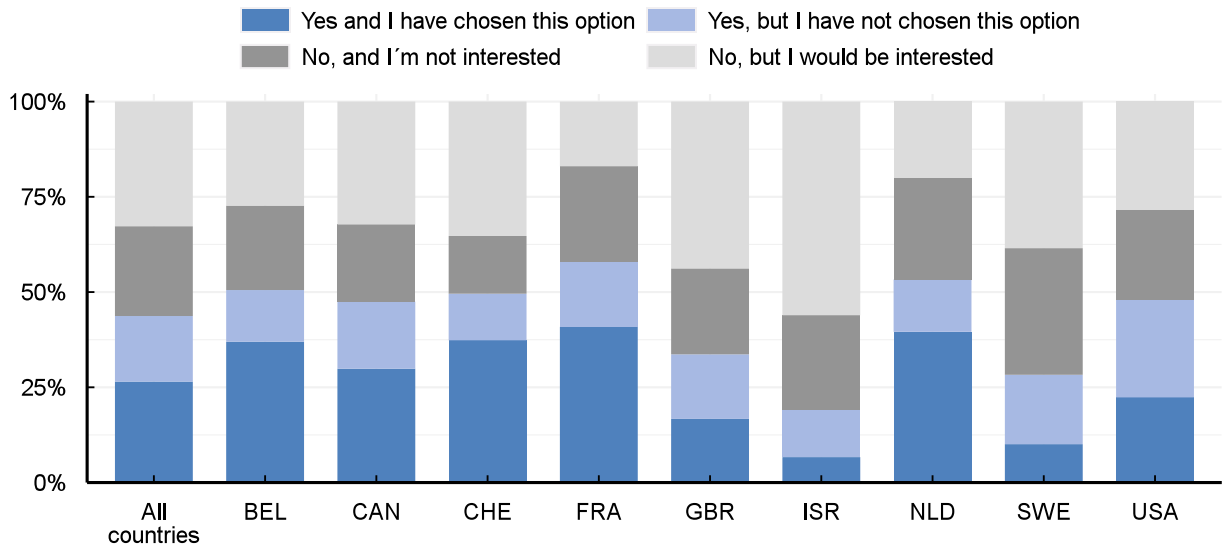
One measure that can reduce electricity cost burdens is the option of paying a lower rate for electricity that is consumed during off-peak hours of the day, i.e. differentiated electricity rates. The availability of this option varies across countries, ranging from 29% in the United Kingdom to 52% in France. Use of this option also varies: as few as 7% and 10% of households report using it in Israel and Sweden, respectively, while as much as 41% of households use it in France. The reported use of differentiated electricity rates does not appear to have changed significantly in countries that participated in the 2011 survey. As with renewable energy, there appears to be considerable unmet demand for this option. Overall, 33% of respondents indicate that they have not been provided the option of selecting differentiated electricity rates, but that they would be interested in it if it was available (Figure 2.4).

Figure 2.4. Differentiated electricity rates could be adopted by more households

Percentage of respondents being offered differentiated electricity rates by their electricity provider



Note: This survey item asked respondents "Have any of the following been proposed to you by your electricity provider?'" Response options included "Yes and I have chosen this option," "Yes, but I have not chosen this option," "No and I'm not interested" and "No, but I would be interested."
Source: OECD (2022), Environmental Policies and Individual Behaviour Change Survey.

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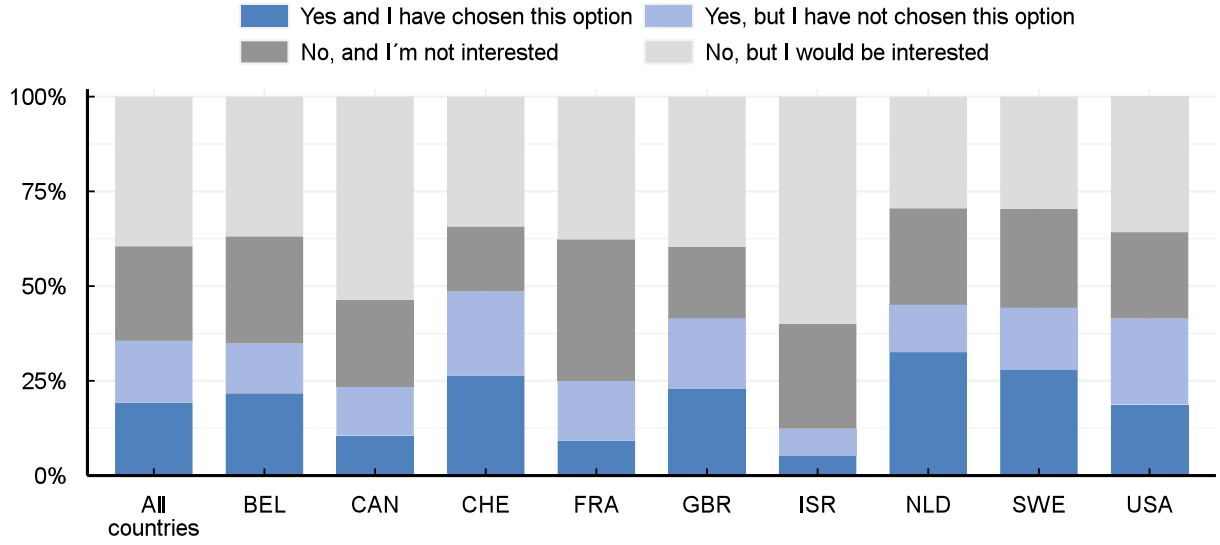
2.2.2. Use of renewably generated electricity from the grid

On average, 19% of households report using renewably generated electricity supplied on the grid (ranging from 5% in Israel to 33% in the Netherlands) (Figure 2.5). A comparison between the 2022 and 2011 survey suggests that renewably generated electricity has become more widely available to households in Canada, France, Sweden and Switzerland (OECD, 2013[10]).[5] Despite this, there appears to be continued unmet demand for renewably generated electricity: 64% of respondents report not having this option, with 39% of them saying that they would be interested in it if it were available. Supply-side regulations, such as renewable energy mandates, could make it more available. It should be noted that country-level results may mask regional differences in the development of renewable energy within countries arising from differences in subnational energy policies (e.g. in Ontario, Canada (CER, 2022[11])). Discrepancies between reported and actual availability of renewable electricity options could indicate a lack of consumer awareness about such options. To this end, information provision regarding the availability of renewable electricity options could also increase their uptake.

Figure 2.5. A large share of households would like electricity generated from renewable sources

Percentage of respondents reporting being offered electricity generated by renewable energy sources by their electricity provider



Note: This survey item asked respondents "Have any of the following been proposed to you by your electricity provider?'" Response options included "Yes and I have chosen this option," "Yes, but I have not chosen this option," "No and I'm not interested" and "No, but I would be interested."
Source: OECD (2022), Environmental Policies and Individual Behaviour Change Survey.

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2.3. Availability and use of low-emissions energy technologies

In the EPIC survey, low-emissions energy technologies include:

- technologies offered to households by their energy providers (smart meters, devices that automatically optimise energy use)
- low-emissions technologies chosen by households that lower emissions either by reducing energy use (low-energy lightbulbs, insulation, double or triple-glazed windows) or by obtaining energy from low-emissions sources (heat pumps, solar panels, battery storage).

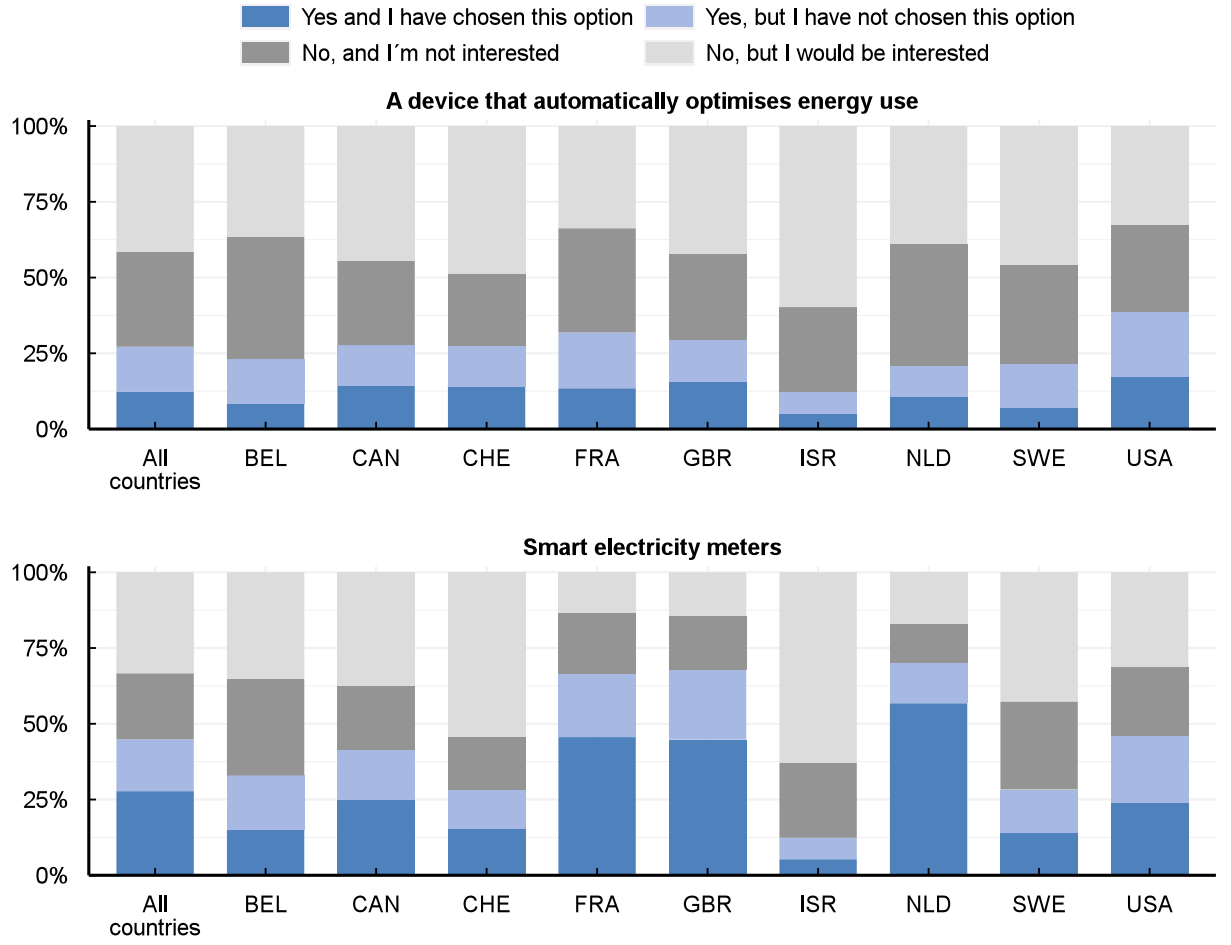
2.3.1. Availability of low-emissions options supplied by electricity providers

In addition to enabling households to monitor their energy use, smart meters allow providers to offer differentiated electricity rates and make use of distributed generation and energy storage. Across countries, 27% of respondents report having been offered low-emissions technologies that help to optimise energy use (e.g. energy monitors) by their electricity providers, but only 12% have chosen to install these devices (top graph, Figure 2.6). Overall 45% of respondents report that they have been offered a smart meter and 28% report that they have installed one (bottom graph, Figure 2.6). Smart meters are reportedly least available in Israel, where only 12% of respondents report being offered one by their energy provider, and most available in the United Kingdom and the Netherlands (67%, and 71% respectively). Use of smart meters is lowest in Israel, at 5%, and highest in the Netherlands, at 58%. There appears to be substantial unmet demand for both smart meters and energy monitors: 42% of respondents report that they were not offered a device that optimises energy use but that they would be interested, while the figure for a smart meter is 33% (Figure 2.6).

Of respondents who reported having a smart electricity meter in 2022, 48% report that the information from the meter has helped them to reduce their electricity consumption. This confirms previous empirical results regarding the impact of smart meters on energy use (Rivers, 2018[12]; Aydin, Brounen and Kok, 2018[13]). Supply-side regulations to increase the provision of smart meters would facilitate their more widespread uptake among consumers. However, 27% of respondents indicate that they have not used the information provided by their smart meters, while 19% do not pay attention to the information, which suggests that there is also scope to improve smart meter use among those who have them. Providing better information on how to use smart meters would be important in improving their use.

Figure 2.6. There is large scope to increase the uptake of technologies that optimise energy use

Percentage of respondents being offered technologies that optimise energy use



Note: This survey item asked respondents "Have any of the following been proposed to you by your electricity provider?'" Response options included "Yes and I have chosen this option," "Yes, but I have not chosen this option," "No and I'm not interested" and "No, but I would be interested."

Source: OECD (2022), Environmental Policies and Individual Behaviour Change Survey.

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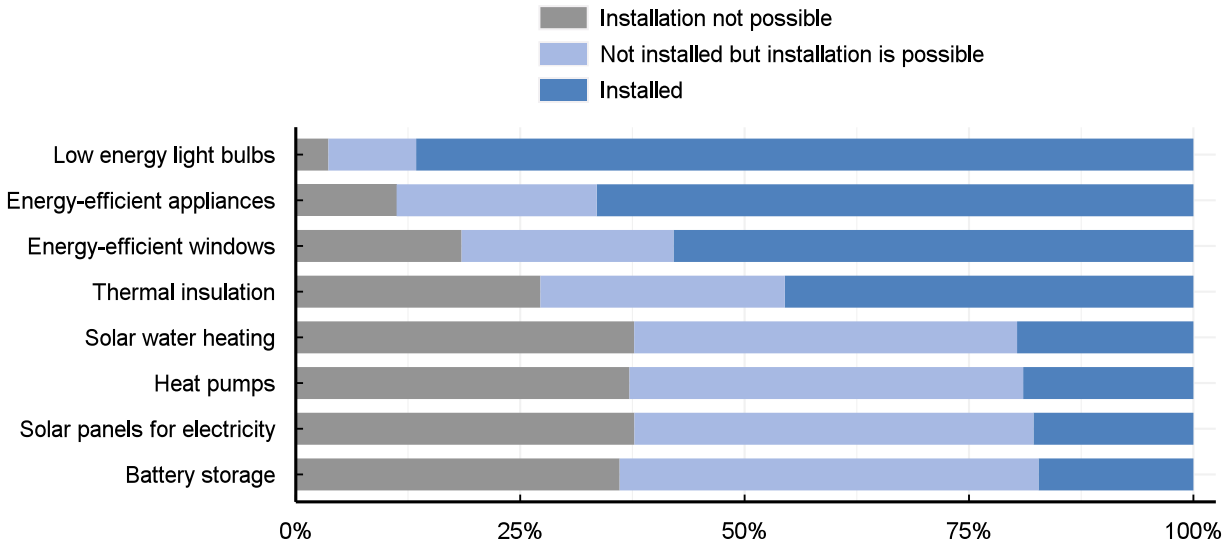
2.3.2. Household adoption of low-emissions energy technologies

Low-emissions energy technologies that households can independently choose to invest in include low-energy lightbulbs, energy-efficient appliances, energy-efficient windows, thermal insulation, solar panels for electricity, solar water heating, heat pumps and battery storage.[6] There is wide variation in installation rates across different types of technologies.

Figure 2.7. Installation of low-emissions technologies is not possible for many households

Percentage of respondents



Note: These survey items asked respondents: "Have you installed any of the following items over the past ten years in your current primary residence?". Respondents who answered "Do not know" or "I am not aware of this or do not know if it is possible to install in my area/home" are not counted in the figure. Respondents who answered "No" were asked a follow-up question: "Why haven't you installed the following items?". For each type of equipment that they had not already installed over the past ten years, respondents selected the main reason why they had not done so. Respondents who selected "Already installed more than 10 years ago" are counted as having installed the equipment. Those that selected "I am planning to install this in the next two/three years", "I am interested but cannot afford it" or "I am not interested" are counted as "Possible to install". The remaining reason: "Not possible (not feasible in my house/ apartment area and/or my landlord would need to install this)" is counted as "Not possible".

Source: OECD (2022), Environmental Policies and Individual Behaviour Change Survey.

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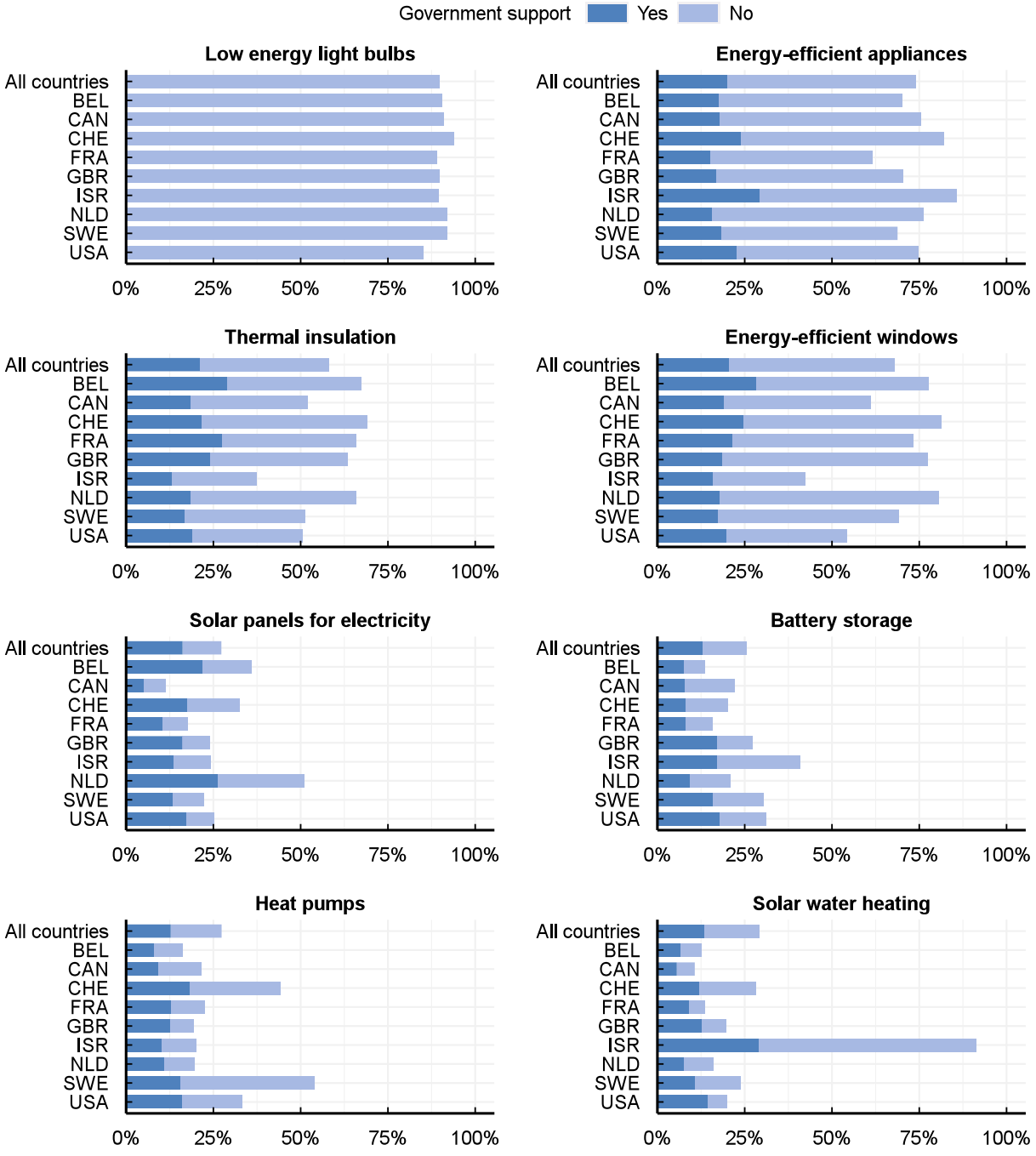
Figure 2.8 reports the proportion of households, among those for whom installation is feasible,[7] that have installed low-emissions energy technologies with and without government support. Findings suggest that even where installation is feasible, overall uptake remains low for some types of equipment: i.e. solar panels (29%), heat pumps (30%) and battery storage (27%). There are three notable exceptions: the Netherlands, where 51% of respondents (among those for whom installation is feasible) have installed solar panels for electricity; Israel, where 92% of respondents have installed solar panels for water heating; and Sweden, where 58% have installed heat pumps. Although energy efficiency measures are generally cost-effective (IEA, 2022[14]), a number of factors can limit their uptake. These include fluctuations in energy prices, credit constraints, lack of information, split incentives between tenants and landlords, and behavioural biases (e.g. the tendency to prefer the status quo) (Ameli and Brandt, 2015[15]).

The adoption of thermal insulation and energy-efficient windows varies across countries, with a range of 39% to 73% for thermal insulation and 44% to 84% for energy-efficient windows. For other types of energy-efficiency equipment, such as highly energy-efficient appliances, most respondents have not benefitted from government support. Highly energy-efficient appliances are adopted by 75% among those that are able to do so (Figure 2.8).

Figure 2.8. A minority of households have received government support for the installation of low-emissions energy technologies

Percentage of households that received government support for the installation of low-emissions energy technologies



Note: These survey items asked respondents "Have you installed any of the following items over the past ten years in your current primary residence? " For each item that respondents had installed, the next question asked: "Has governmental financial support (e.g. grants, loans with below-market interest rates, tax exemption) encouraged you to install any of the following items in your residence?" The sample sizes for each item are the following: Battery storage: 3996, Energy-efficient appliances: 6826, Energy-efficient windows: 6317, Heat pumps: 4353, Low energy light bulbs: 7858, Solar panels for electricity: 4792, Solar water heating: 4535, Thermal insulation: 5326.
Source: OECD (2022), Environmental Policies and Individual Behaviour Change Survey.

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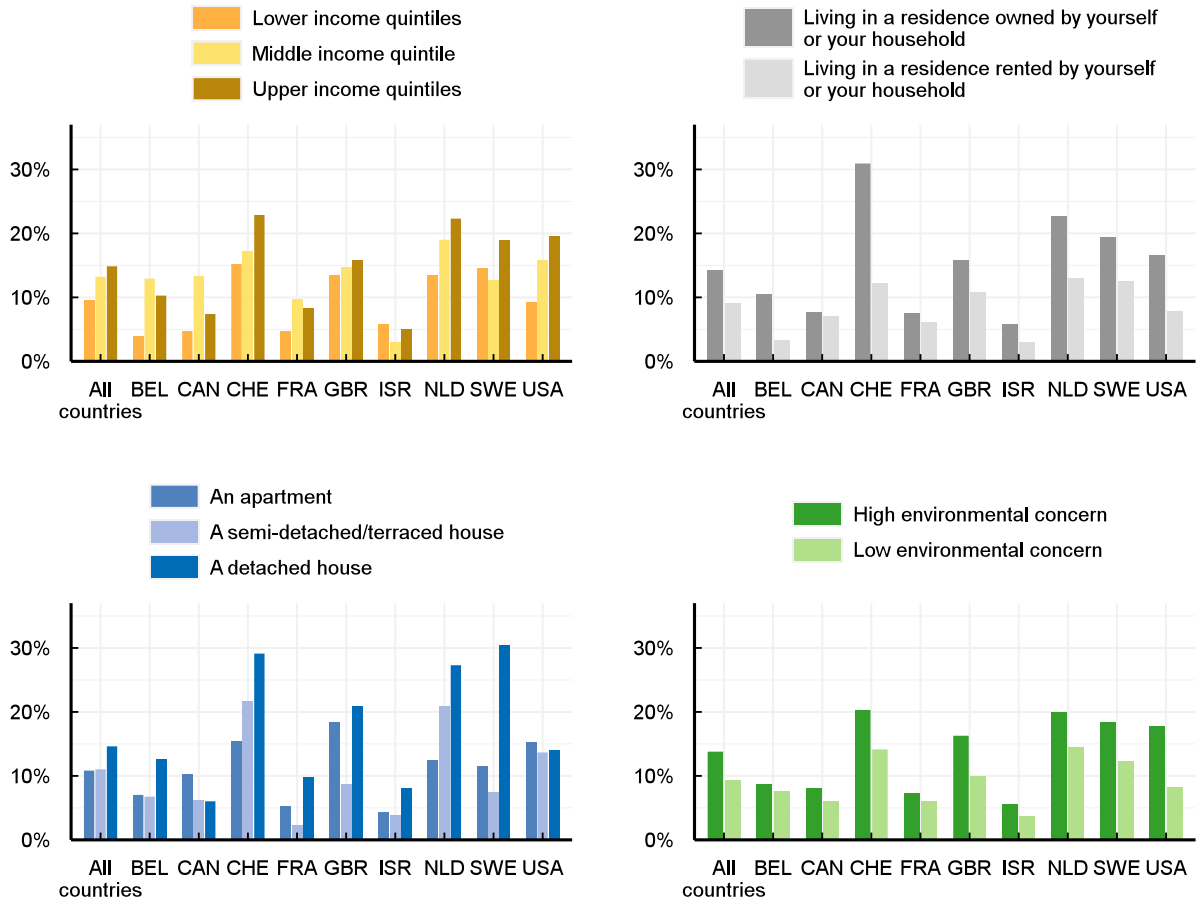
While the general use of low-emissions heating or cooling options (i.e. using heat pumps, solar heating, or electricity generated from renewables for heating and cooling needs) varies across countries, use within countries exhibits several patterns. First, in most countries, households that report using these options tend to be of high or middle income (Figure 2.9). On average, 15% of high-income households use low-emissions heating and cooling, versus 10% of low-income households. In France and the United States, households in the high-income quintiles are twice as likely to report using these options as those in the low-income quintiles. Low-income households are less likely than high-income households to install costly low-emissions technologies such as heat pumps. This could in part be attributed to financial resources available.[8] However, it could also be due to the fact that low-income households may be more likely to be renting and may not have the ability or incentives to install such equipment in their residence.

Indeed, homeowners report using low-emissions heating or cooling more frequently than tenants (14% versus 9%), with the most striking differences observed in Belgium, Switzerland and the United States. Dwelling type also appears to be associated with the use of low-emissions options. In seven of the nine countries, those living in detached houses more frequently report using these options than those living in apartment buildings (17% of house dwellers versus 11% of apartment dwellers) (Figure 2.9).[9] Finally, in all countries, environmentally concerned respondents are also more likely to use these options. In the United States, the prevalence of environmentally concerned respondents that report using these technologies is more than two times that of those with low environmental concern. Homeowners are also more likely than tenants to report using self-supplied electricity or electricity from local micro- or mini-grids.

Figure 2.9. Use of low-emissions heating or cooling varies by income level, tenant status, dwelling type, and environmental concern

Percentage of respondents who use low-emissions heating or cooling



Note: This survey item asked respondents: "Which of the following energy sources do you use for space heating/cooling? Please select all that apply." Response options included electricity; gas; oil coal or other fossil fuels; wood or burning pellets; district heating or cooling; heat pumps; solar space heating, other and "Don't know". Respondents were able to select multiple responses except when selecting "Don't know". Low-emissions heating or cooling includes solar space heating, heat pumps, or electricity generated from renewable sources. Lower income quintiles refer to income quintiles 1 and 2; middle income quintile refers to income quintile 3; and upper income quintiles refer to income quintiles 4 and 5.
Source: OECD (2022), Environmental Policies and Individual Behaviour Change Survey.

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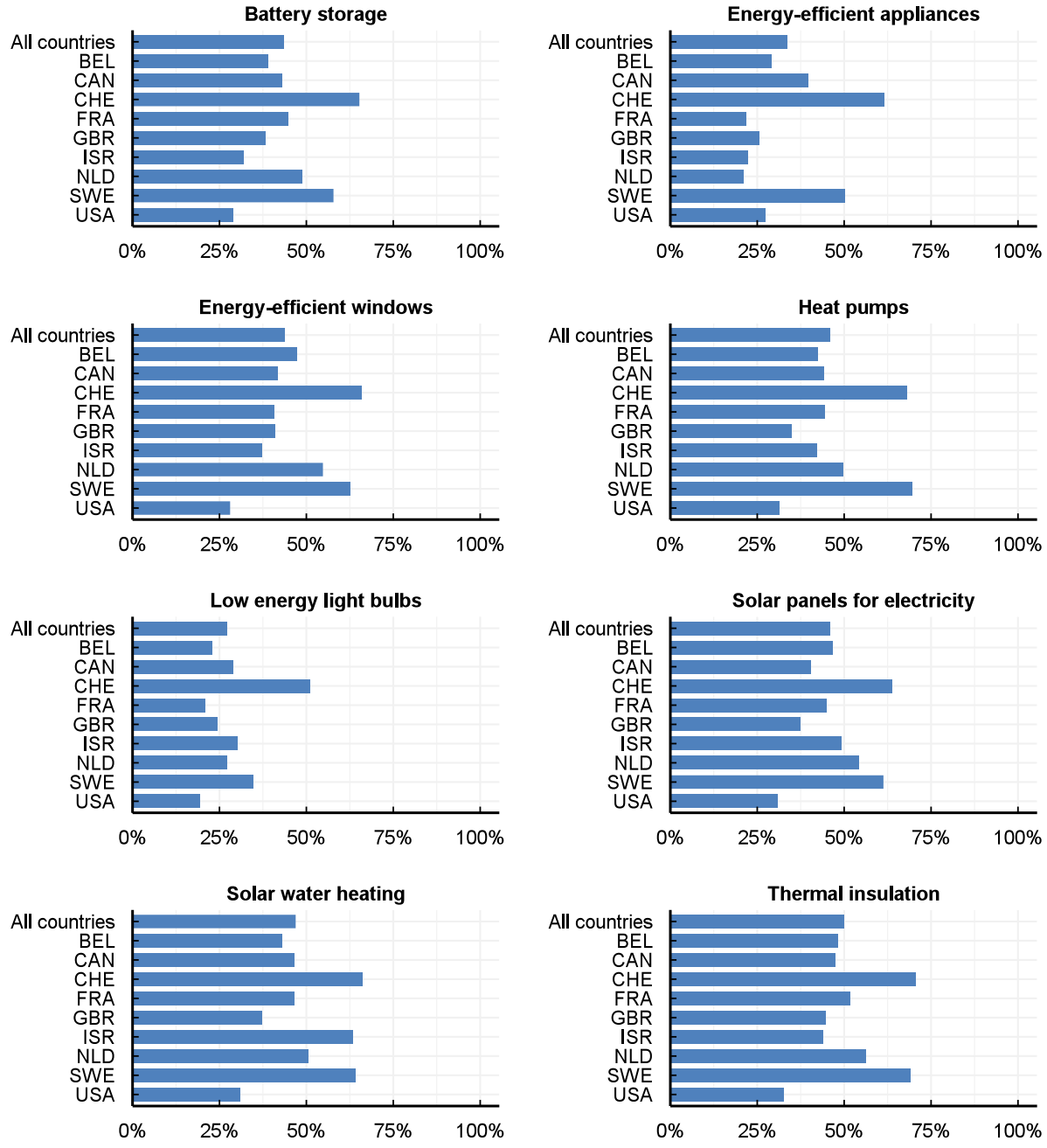
2.3.3. Barriers to household adoption of low-emissions energy technologies

Survey results point to several barriers in the uptake of low-emissions energy technologies. Figure 2.10 displays the percentage of non-adopting households reporting that installing low-emissions technologies is not possible. Across countries and equipment types, close to half of non-adopting households indicate that installation is not possible, revealing that supply constraints (e.g. impossibility of installations in apartment buildings or the need for landlord permission) remain a significant barrier to the uptake of energy-saving equipment.[10] Other factors, such as affordability or lack of interest, are also reported by households as reasons for not adopting these technologies (Figure 2.11). Unsurprisingly, equipment that is expensive to purchase and install is also more likely to be associated with affordability-related constraints. For instance, while light bulbs are relatively easy to install and their purchase costs are relatively low, heat pumps are more costly and subject to more significant installation constraints. Government support for energy efficiency investments could therefore be proportional to the installation costs of technologies and could also better incentivise landlords in making such installations.

Figure 2.10. The feasibility of installing energy efficiency measures varies by technology and country

Percentage of non-adopting households reporting that installation is not possible



Note: These survey items asked respondents: "Have you installed any of the following items over the past ten years in your current primary residence?". Respondents who answered "No" were asked a follow-up question: "Why haven't you installed the following items?". For each type of equipment that they had not already installed over the past ten years, respondents selected the main reason why they had not done so. For each item, percentages are based on the sub-sample of respondents who did not install the item. Sample sizes are the following: Battery storage: 5064, Energy-efficient appliances: 2428, Energy-efficient windows: 3044, Heat pumps: 5476, Low energy light bulbs: 1009, Solar panels for electricity: 6121, Solar water heating: 5718, Thermal insulation: 3739.

Source: OECD (2022), Environmental Policies and Individual Behaviour Change Survey.

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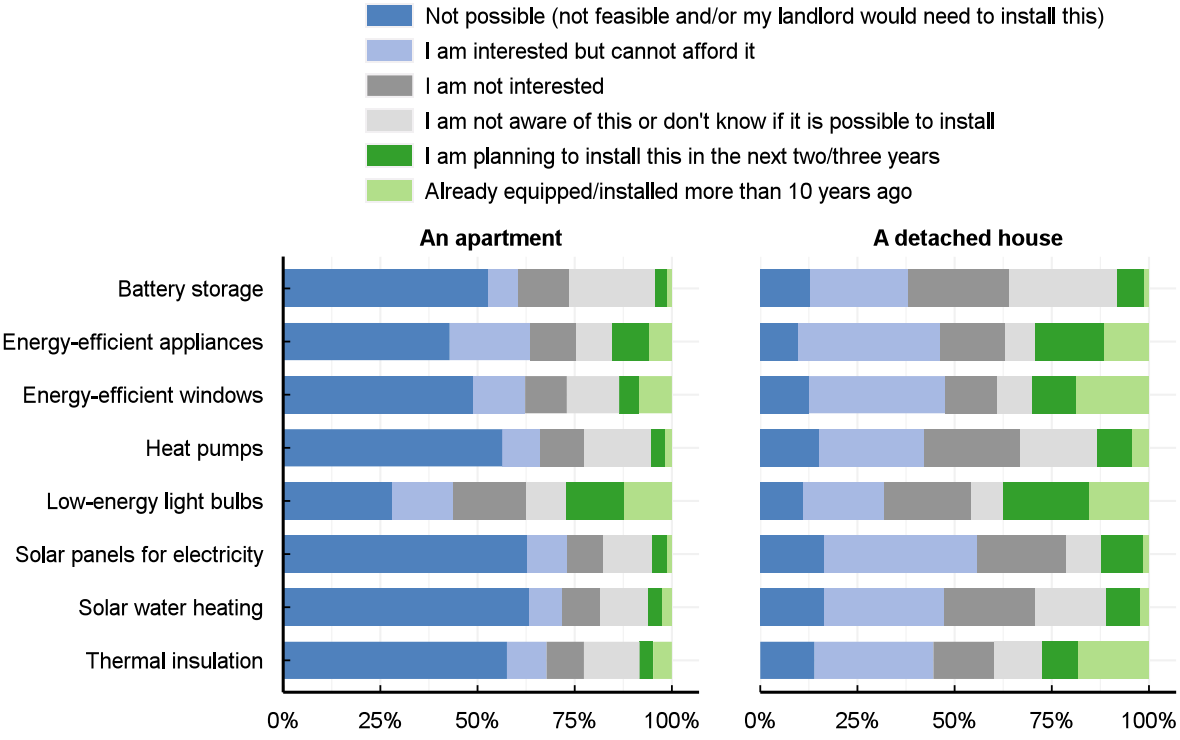
Survey results indicate that feasibility not only varies by equipment type, but also by household characteristics. Compared to homeowners and those living in detached houses, tenants and those living in apartment buildings are more likely to cite the lack of feasibility as a reason for not installing low-emissions energy technologies. Lack of feasibility reflects the fact that installation is technically not possible in their residence or that the landlord, in the case of tenants, would need to install it (Figure 2.11).[11] Overall, 57% of apartment dwellers report that they have not installed battery storage, heat pumps or solar panels because installation is not possible, compared to 15% of those living in detached houses. Some respondents indicated that they are not interested in installing low-emissions technologies without specifying a reason (ranging from 12% for energy-efficient windows to 20% for low-energy light bulbs).

Figure 2.11. Barriers to installation of low-emissions technologies differ across residence types

Percentage of respondents stating different reasons for not having installed low-emissions energy technologies



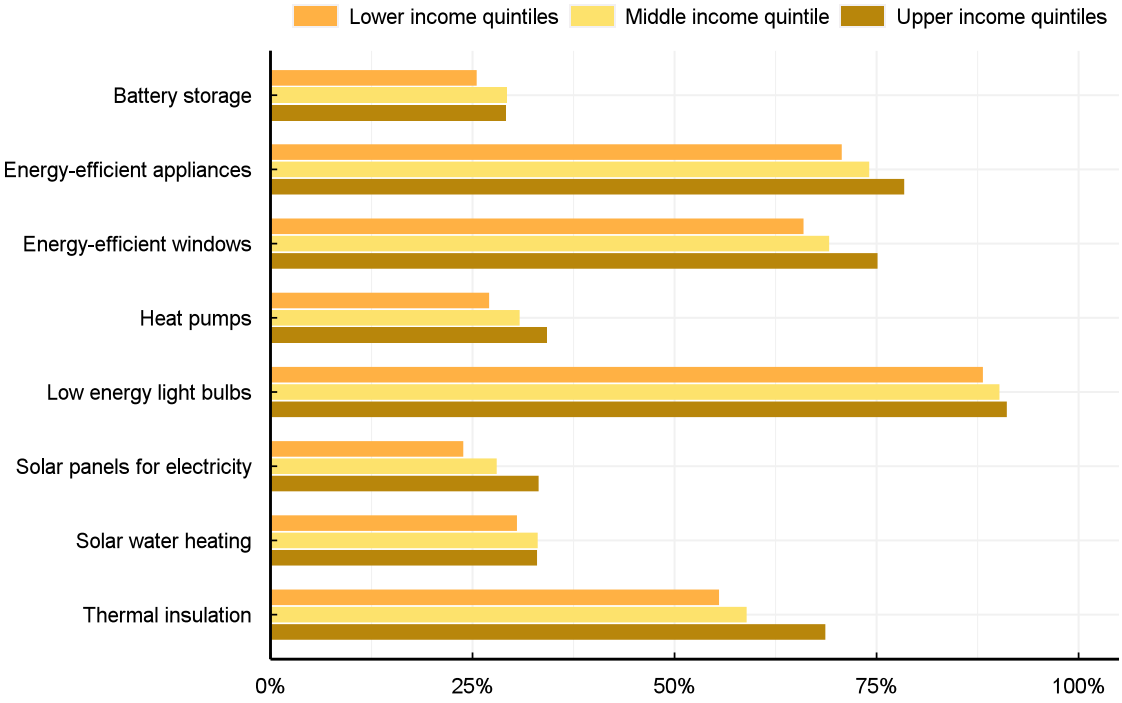
Note: This survey item asked respondents: "Why haven't you installed the following items?". For each type of equipment that they had not already installed over the past ten years, respondents selected the main reason why they had not done so.
Source: OECD (2022), Environmental Policies and Individual Behaviour Change Survey.

StatLink https://stat.link/4knja1

Figure 2.12 shows that low-income households report installing equipment less frequently than high-income households. Differences in uptake between low and high-income households are largest for thermal insulation (13%) and solar panels for electricity (9%). These reported levels of uptake suggest that, even where supply constraints have been eliminated, affordability appears to be a barrier to the uptake of equipment with high upfront installation costs.

Figure 2.12. Expensive low-emissions energy technologies are less likely to be installed by low-income households

Share of respondents who installed the item over the past ten years among households for whom installation is possible



Note: This survey item asked respondents: "Have you installed any of the following items over the past ten years in your current primary residence?" Lower income quintiles refer to income quintiles 1 and 2; middle income quintile refers to income quintile 3; and upper income quintile refers to income quintiles 4 and 5. Respondents who indicated that installation was not feasible are excluded from the sample.
Source: OECD (2022), Environmental Policies and Individual Behaviour Change Survey.

StatLink https://stat.link/5whu9q

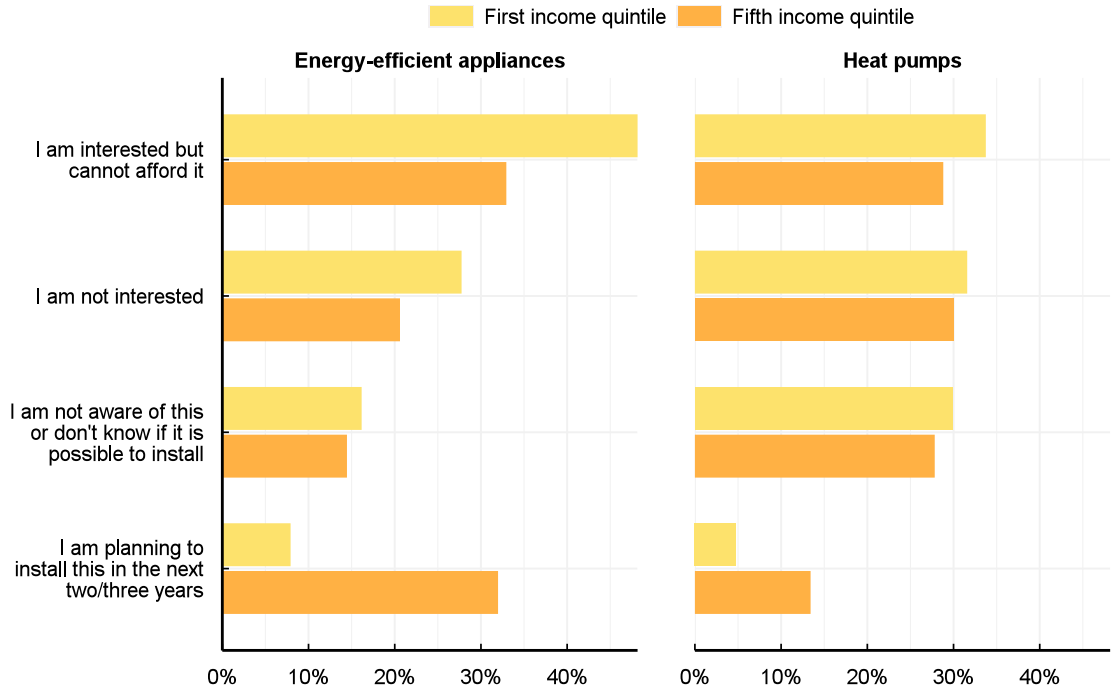
Evidence suggests that consumers are willing to pay more for more energy-efficient appliances (Galarraga, González-Eguino and Markandya, 2011[16]). However, the results presented in Figure 2.13, Figure 2.12 and Figure 2.13 confirm that affordability nevertheless remains a barrier to the uptake of low-emissions energy technologies. In all countries and across all types of technologies, 21% of all respondents report that purchase and installation costs are prohibitive, regardless of their income. Among homeowners, affordability, rather than feasibility, is the main reported barrier to uptake, with 29% of households reporting that they have not installed low-emissions energy technologies because they cannot afford them. Affordability is more frequently cited by low-income households than high-income households as the main reason for not installing technologies such as energy-efficient appliances and heat pumps (Figure 2.13).

Further confirming the importance of affordability, respondents more frequently report that they plan to install lower-cost items such as efficient appliances (20%) and low-energy lightbulbs (26%) than higher-cost items such as heat pumps (9%). This finding could in part reflect differences in the awareness and availability of these options. Additionally, high-income households are more likely to report that they intend to install low-emissions technologies than low-income households (Figure 2.13). The finding is particularly striking for energy-efficient appliances, which 32% of high-income households plan to install in the near future, compared to 8% of low-income households (Figure 2.13). These findings suggest that improving the affordability of low-emissions technologies and the feasibility of their uptake among low-income households, tenants and those living in apartments should be a policy priority. Although support for high-income households should be lower than that for low-income households, even high-income households

indicate a need for reduced costs to install low-emissions energy technologies. Understanding and overcoming these reported barriers could boost adoption rates.

Figure 2.13. Reasons for not installing low-emissions energy technologies for low-income and high-income respondents

Percentage of respondents who did not install low-emissions energy technologies and for whom installation is feasible



Note: This survey item asked respondents: "Why haven't you installed the following items?". For each type of equipment that they had not already installed over the past ten years, respondents selected the main reason why they had not done so.
Source: OECD (2022), Environmental Policies and Individual Behaviour Change Survey.

StatLink https://stat.link/moyjck

When asked what would encourage them to reduce energy use further, respondents across the sample indicated their desire for more affordable and better-performing energy-efficient appliances (Figure 2.19, Section 2.5). A lack of knowledge about the equipment and its availability is the most common reason given for not installing battery storage (25% of households). Many respondents (29%) also report a lack of knowledge about heat pumps (Figure 2.13). Both high- and low-income households share a similar lack of awareness of low-emissions technologies generally (15% and 17% respectively).

2.4. Energy conservation behaviours

Energy savings can be accomplished by either improving the efficiency with which energy is used (e.g. by purchasing more energy-efficient appliances), or by reducing overall energy use (e.g. by turning off the lights when leaving a room). Overall, 92% of respondents state that they often or always turn out the lights when leaving a room, and 65% of respondents sampled either often or always air-dry their laundry (Figure 2.14). Significantly fewer respondents report air drying their laundry in Canada and the United States (44% and 35%, respectively). Overall, respondents state that they generally try to minimise their use of heating and cooling (68%) and of hot water (63%). Sweden and Israel reported the lowest levels of engagement in these two practices, with highest engagement reported in Belgium, France and the United Kingdom. Some of the observed variation across countries is likely to reflect dwelling type, climatic conditions and energy prices.

Figure 2.14. Turning off lights is the most common energy conservation behaviour

Percent of respondents indicating frequency of engagement

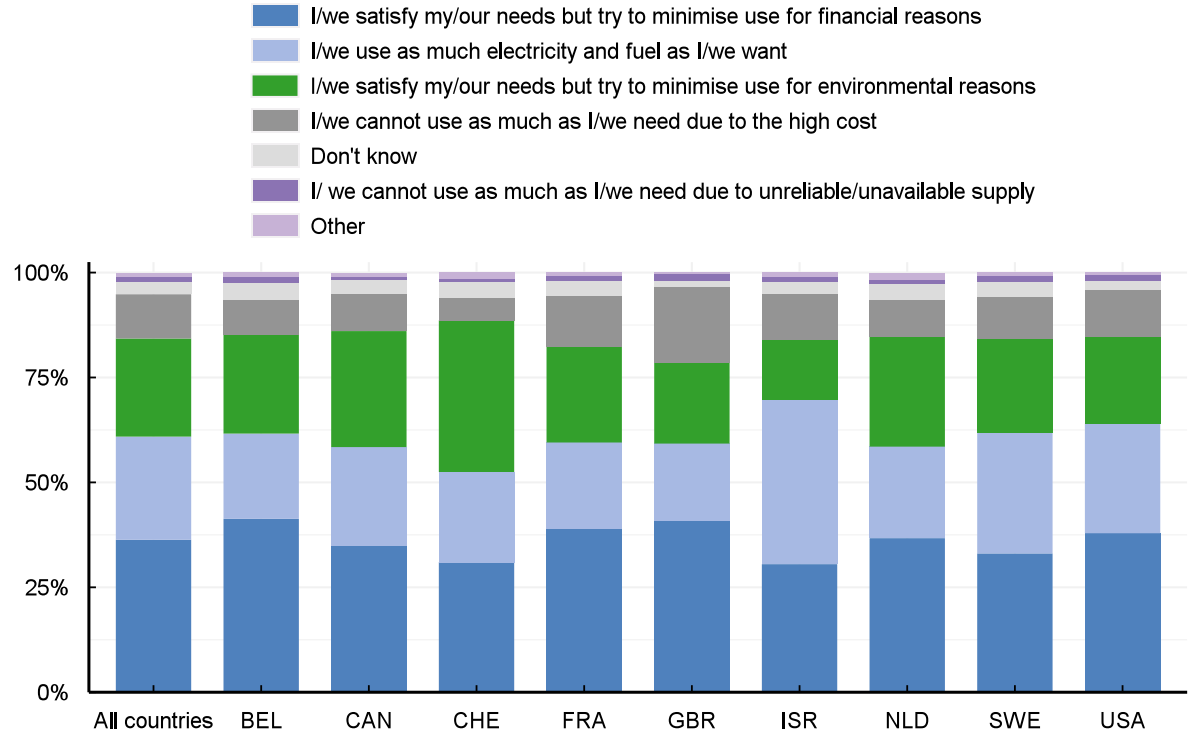
Note: This survey item asked respondents: "How often do you do the following in your daily life?" Response options were never, occasionally, often, always or not applicable. The figure shows relative frequencies of response options excluding not applicable.
Source: OECD (2022), Environmental Policies and Individual Behaviour Change Survey.

StatLink https://stat.link/bim5j7

Although the majority of respondents report that they are able to satisfy their energy needs, 46% indicate that they minimise energy use for financial reasons (Figure 2.15). Slightly fewer, 30% overall, report doing so for environmental reasons. Switzerland is an outlier in this regard, with 45% of respondents reportedly minimising energy use for environmental reasons. Across countries, 25% of respondents – ranging from 17% in the United Kingdom to 39% in Israel – indicate that they use as much energy as they want without regard for financial or environmental considerations. Across countries, the percentage of respondents indicating that they cannot use as much energy as they need due to the high cost ranges from 6% (in Switzerland) to 18% (in the United Kingdom). Since respondents were able to select multiple statements to characterise their household energy use, Figure 2.15 shows the relative frequency with which each response was selected out of the total number of responses selected in each country.

Figure 2.15. Most respondents minimise energy use for financial rather than environmental reasons

Relative proportion of each response option



Note: This survey item asked respondents: "Thinking about your energy use at home, what statements best describe your household? Please select all that apply." The figure shows the relative frequency of response options for each country. “Needed consumption” refers to self-perceived levels of energy use that the respondent believes are necessary to achieve a minimum level of well-being.
Source: OECD (2022), Environmental Policies and Individual Behaviour Change Survey.

StatLink https://stat.link/gsfnzh

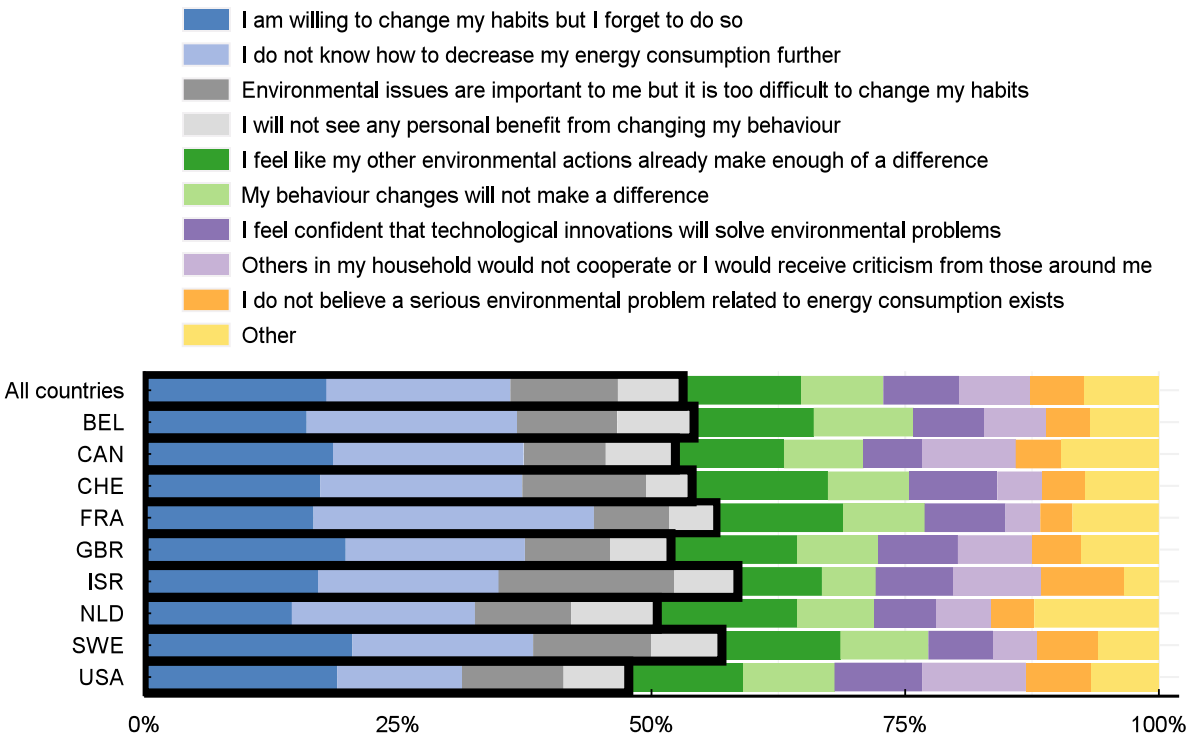
The degree to which respondents act to reduce energy use varies according to socio-economic characteristics. Low-income households appear to be more likely to reduce energy use (e.g. minimising the use of heating and cooling and air drying laundry) to save money. Women report engaging in all energy conservation behaviours slightly more than men. Respondents who report a high level of concern for environmental issues and climate change are more likely to report saving energy, especially minimising the use of heating and cooling, as well as hot water. There were no consistent differences in energy conservation across residential area (urban vs. rural) or dwelling type (apartment vs. house).

When asked why they do not always engage in energy conservation behaviours, 36% of respondents cited either forgetfulness or a lack of practical knowledge on how to do so (Figure 2.16). Other reasons cited include the difficulty of changing one's habits (11%) and the perception that there is no personal benefit to changing one's behaviour (6%). Combined, these account for around half of all the reasons cited (the bars outlined in black in Figure 2.16). Importantly, these reasons can be fairly easily addressed through low-cost demand-side measures that have documented impacts on energy conservation, such as sustainable default options (e.g. temperature settings), providing feedback on energy use, and enabling comparisons with other households (IEA, 2021[17]). Since respondents were able to select multiple reasons why they do not engage more frequently in energy conservation behaviours, Figure 2.16 shows the frequency with which each reason was cited of out of the total number cited in each country.

The other reasons included in Figure 2.16 (e.g. "I feel like my other environmental actions already make enough of a difference") reflect attitudinal factors that may be more difficult to address through public policies. Where attitudinal factors reflect a lack of information (e.g. on the impacts of certain behaviours), these reasons for inaction could be targeted by education efforts. However, research indicating that attitudes are relatively stable over time, and that information is only accepted if it is considered credible, suggests that the role of information provision could be limited in some contexts (Wood and Vedlitz, 2007[18]; Druckman and McGrath, 2019[19]). Rather than relying on attitudinal change or persuasion, therefore, communications could focus on aligning messages with the types of information that people find credible, such as the cost savings from energy conservation (Druckman and McGrath, 2019[19]). Information therefore needs to be carefully designed and targeted, paying attention to its alignment with underlying preferences and the credibility of the messaging.

Figure 2.16. Habit and lack of knowledge are holding back energy conservation actions

Proportion of the total number of times each reason was cited



Note: The segments of the bars outlined in black reflect the proportion of reasons cited that could be relatively easily targeted by public policies. This survey item asked respondents: "Your answers on the previous question indicate that you do not always try to reduce energy consumption in your household. Please help us understand the most important reasons why not: Please select all that apply." The figure shows relative frequency of the response options for each country. This item was asked of those respondents who indicated that they did not always engage in at least one of the five energy conservation behaviours. The sample sizes in each country are the following: BEL: 805, CAN: 840, CHE: 840, FRA: 785, GBR: 785, ISR: 800, NLD: 815, SWE: 852, USA: 1540.
Source: OECD (2022), Environmental Policies and Individual Behaviour Change Survey.

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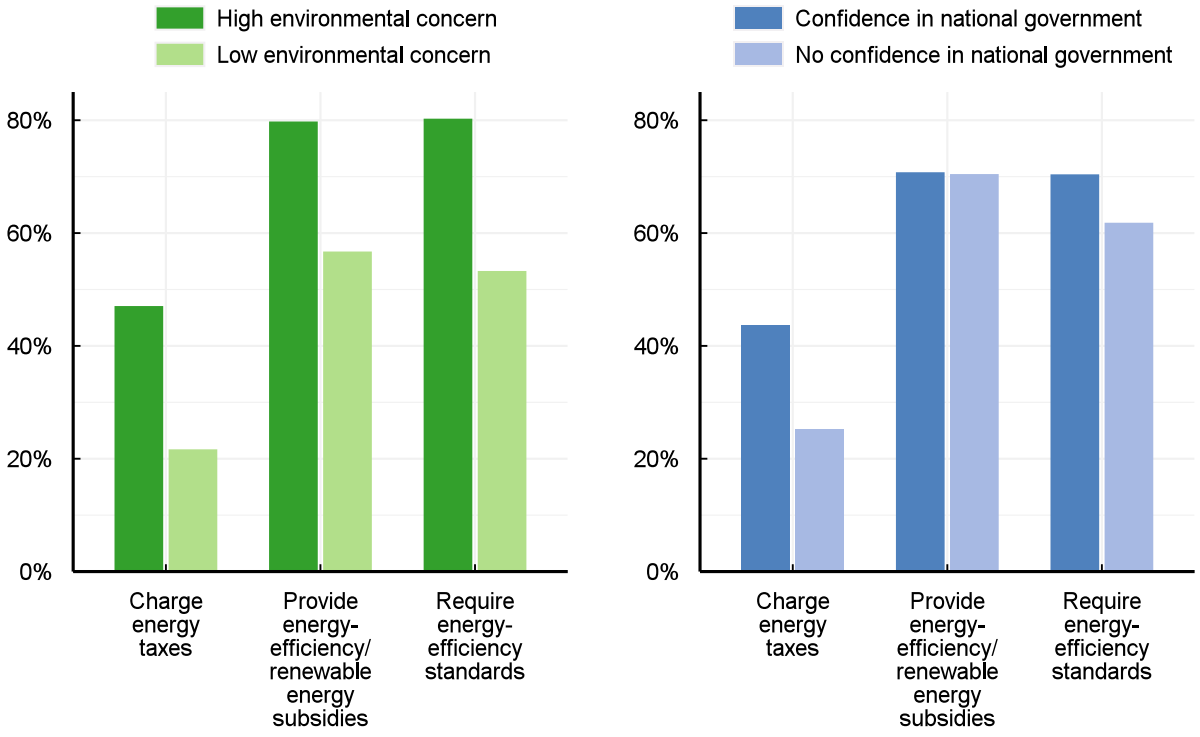
2.5. Support for energy policies

Respondents across countries indicate high support for energy-related policies. These policies include energy efficiency standards, subsidies for housing renovation, purchasing energy-efficient appliances or investing in renewable energy equipment, and taxing the use of energy or the purchase of highly energy-consuming appliances. Overall, 72% support or strongly support subsidies for housing renovations or energy-efficiency equipment, while 71% support energy efficiency standards. There is markedly less support for measures involving taxes or charges (38% overall), with the highest level of support reported by respondents in Switzerland (49%).[12] Those who are environmentally concerned are more supportive of energy-related policies (Figure 2.17). There is less support for energy taxes, especially among those less concerned about the environment and those who have no confidence in the national government. But even those who are environmentally concerned are less likely to support these types of policy than energy efficiency standards or renewable energy subsidies.

A number of additional factors determine support for public policies, including the equity, objectives and use of revenues generated by the policy in question (Dechezleprêtre et al., 2022[20]). Taken together, the survey results can provide guidance for targeted awareness campaigns to increase public support for energy-related environmental policies. Groups of respondents that express strongest disagreement with public policies could be of special relevance for communication efforts given that these groups are also likely to be the most publicly vocal regarding their opposition.

Figure 2.17. Environmental concern and confidence in the national government drive support for energy policies

Percentage of respondents supporting or strongly supporting the policy measure



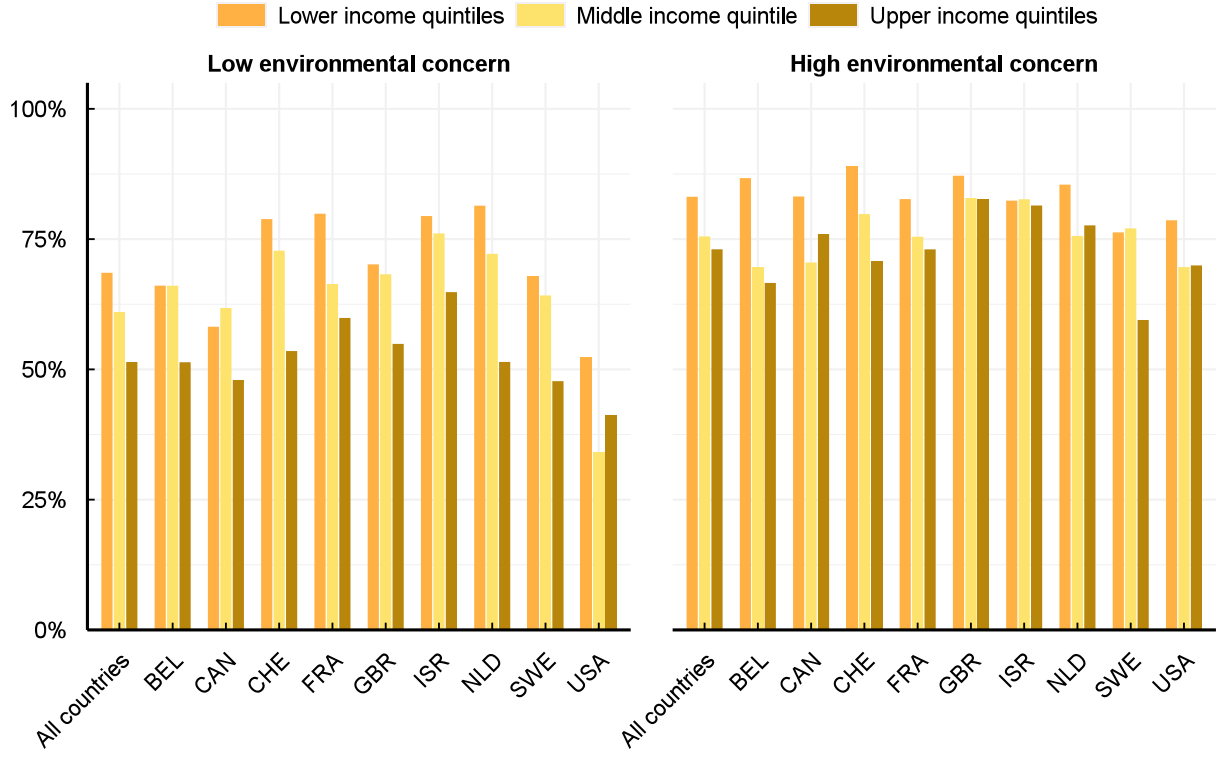
Note: This survey item asked respondents: "To what extent do you support the following potential policy measures?" For each policy, respondents could select strongly against, against, indifferent, support or strongly support.
Source: OECD (2022), Environmental Policies and Individual Behaviour Change Survey.

StatLink https://stat.link/1u50sj

Overall, 70% of respondents – both high and low-income – agree that low-income households should receive government support to help them pay for energy-efficient equipment. Respondents with high environmental concern express greater support for subsidies to low-income households than those who are less environmentally concerned (Figure 2.18). Meanwhile, low-income households express more support than high income households, especially those that are more environmentally concerned. Targeted subsidies are supported by 83% of households that are characterised by low income and high environmental concern. However, more than two-thirds of high-income respondents in Canada, the Netherlands, France, Israel and the United Kingdom also express support for these subsidies, reflecting the cited importance of affordability within this group, as well.

Figure 2.18. Environmentally concerned respondents are most in favour of government support to low-income households for low-emissions energy technologies

Percentage of respondents agreeing that low-income households should receive government support (e.g. subsidies)



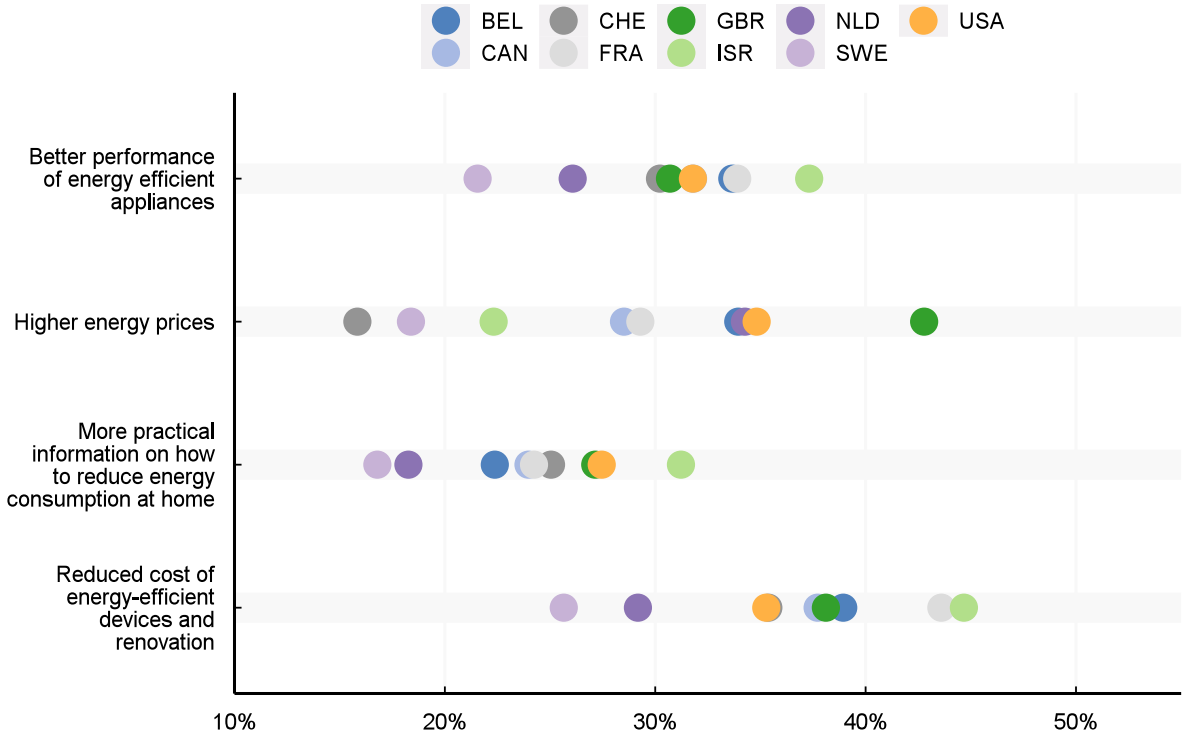
Note: This survey item asked respondents: "Do you think that low-income households should receive government support (e.g. subsidies) to help them pay for energy-efficient equipment?" Respondents could select yes, no or don't know.
Source: OECD (2022), Environmental Policies and Individual Behaviour Change Survey.

StatLink https://stat.link/lzvtxi

Respondents were also asked which factors would be very important in encouraging them to reduce their own energy use. They were notably asked about: better-performing energy-efficient appliances, higher energy prices, more practical information on reducing energy consumption, and lower costs for energy-efficient devices and renovation. Approximately 20% of respondents indicated that all of these energy-related policies would be very important. Reduced costs for energy-efficient devices and for renovation was on average cited the most often (36%), followed by better performance of energy-efficient appliances (31%) (Figure 2.19). There was considerable variation in the extent to which respondents cited higher energy prices, ranging from 15% in Switzerland to 42% in the United Kingdom. Fewer respondents rated more practical information on how to reduce energy use as very important. Of all the countries surveyed, respondents from Sweden expressed the least support of all measures apart from higher energy prices.

Figure 2.19. Reducing the cost of energy-efficient devices and renovation would be important in encouraging respondents to reduce their energy consumption

Percentage of respondents citing each reason as very important



Note: This survey item asked respondents: "How important would the following factors be in encouraging you to reduce your energy consumption?" For each factor, respondents selected not at all important, not important, indifferent, important, very important or don't know.
Source: OECD (2022), Environmental Policies and Individual Behaviour Change Survey.

StatLink https://stat.link/ngi96f

Low-income households more frequently report costs as important than high-income households. However, this is not the case in the United Kingdom, Canada and the United States, where high-income households cite cost as an important factor more frequently than low-income households. Differences in the cost of energy-efficient appliances (IEA, 2020[21]) and the provision of government support for low-income households could play a role in explaining the distribution of respondents citing cost as an important factor.

A qualitative comparison with a similar question asked in the 2011 EPIC survey suggests that reduced costs for low-emissions energy technologies are more important to respondents in 2022 than they were in 2011 in the relevant countries. The relatively higher importance of costs in 2022 could be reflective of a fall in the importance of other factors, such as awareness or availability, over this time period.

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Notes

[1] Over the same period, global GDP per capita grew at an annual rate of 3.9%, suggesting that a 1% increase in income is associated with an increase in electricity demand of approximately 0.4%. However, these relative changes should not be interpreted as an equivalent measure to elasticity. Liddle, Smyth and Zhang (2020[22]) estimate income elasticities in 26 OECD countries, ranging from 0.6 to 0.8. Liddle and Huntington (2020[26]) find a GDP elasticity of energy demand of approximately 0.7 for 37 OECD and 41 non-OECD countries, with no evidence of significant variation across countries and across income levels within countries.

[2] See Annex B on the design and implementation of the EPIC survey and on the quality of the panel of respondents.

[3] Differences in samples as well as in the formulation of some questions prevents direct comparisons of the results across survey rounds.

[4] Monthly cost as elicited in the EPIC Survey does not include the amortised investment cost of low-emissions energy technologies (i.e. installation costs).

[5] While results from the three survey rounds are not strictly comparable due to differences in sample sizes, representativeness, and in how the questions are worded, large differences observed over time can indicate an overall trend.

[6] Battery storage helps to smooth fluctuations in energy supply from renewables, increasing their reliability as an energy source. It also enables households to store self-generated electricity. Respondents were asked about battery storage generally, i.e. not in connection with self-generated electricity.

[7] The survey gave households the option to indicate that installation of equipment was not possible by selecting “Not possible (not feasible in my house/apartment/area and/or my landlord would need to install it”).

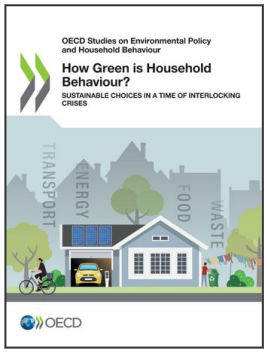
[8] Some evidence suggests that resource constraints can exacerbate consumer myopia (a tendency to focus on certain types of decisions and/or on costs and benefits in the short term versus the long term) related to investment decisions (Damigos et al., 2021[23]; Leard, Linn and Springel, 2019[25]). This tendency could also affect investments in low-emissions energy technologies (Gillingham and Palmer, 2014[24]).

[9] This finding could reflect the fact that apartment residents have lower heating needs than residents in detached houses. It could also reflect correlations between dwelling type and variables such as income and tenant status (renter or owner). The former affects the financial resources available to make upfront investments in low-emissions energy technologies, while the latter has implications for the time horizon and size of potential benefits of such investments.

[10] To the extent that low-income households are also renters, the primary barrier to installation of low-emissions technologies will be feasibility, rather than cost.

[11] The survey gave households the option to indicate that installation of equipment was not possible by selecting “Not possible (not feasible in my house/apartment/area and/or my landlord would need to install it”).

[12] Though lower, this is comparable to results from Wave 7 of the Swiss Environmental Panel (Gomm et al., 2022[27]), held in May–August 2021, which found that 60% of respondents agreed or strongly agreed with the statement “A CO_2 tax is a suitable means of reducing Switzerland's greenhouse gas emissions.”



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Sustainable Choices in a Time of Interlocking Crises

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