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»»» KfW Energy Transition Barometer
2022 Energy transition more urgent
than ever – much potential but
households cannot all participate
equally

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Energy transition more urgent than ever – much potential but households cannot all participate equally

The energy transition is more urgent than ever – for ecological and economic reasons

The current gas crisis, with the severe additional pressure it is placing on households and enterprises, and the increasingly visible impact of climate change both underscore the need for a more sustainable energy supply.

Support for the energy transition remains high

Around 90% of households in Germany believe the energy transition is important. At the same time, many have serious doubts as to whether it can be achieved with a fair distribution of burdens between all groups of society. These reservations negatively impact on households' willingness to take action.

Share of energy transition stakeholders continues to grow

In 2021, around 29% of households used at least one of the following technologies: photovoltaic solar energy, solar thermal energy, battery storage, heat pumps, combined heat and power, wood pellet heating, electric car. A further 13% plan to do so this year. Photovoltaic solar energy and electric mobility are expected to grow at the fastest rate. Users of these technologies mainly include high-income households and property owners.

High savings potential in buildings

There is great potential for reducing the consumption of fossil fuels, which have become expensive. For example, only around 15% of buildings currently have modern triple-glazed windows. Heating systems also have room for improvement. Even among households residing in well-insulated buildings, so far not more than one third use climate-friendly heating technologies such as solar thermal power or heat pumps.

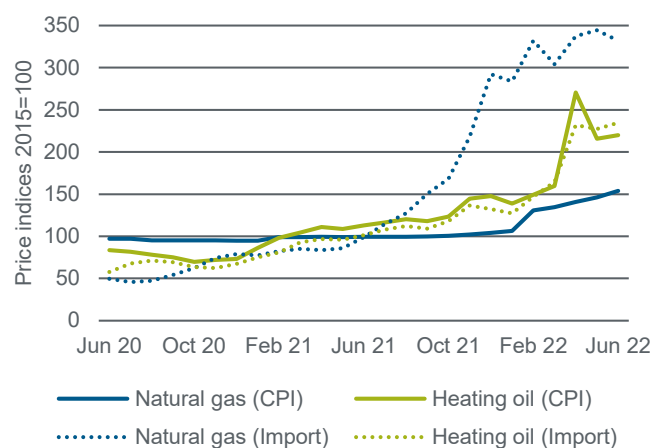
Acceptance of energy transition must be bolstered with fair incentives and compensation mechanisms

As lower-income households are most likely to reside in poorly insulated buildings with high potential for savings, financial barriers to modernisation and relevant information deficits must be eliminated here in particular. This can also help to dispel their doubts about an equitable energy transition and take broader sections of society on board in the future, which will not just prevent social tension but is essential to achieving the climate targets.

The economic dimension of the energy transition is becoming increasingly apparent

The past year has highlighted the importance of the energy transition in various ways. The consequences of climate change are becoming increasingly evident and took on a new face with the flood disaster in Germany's Ahr Valley in July last year and the drought periods of this summer. Furthermore, the increase in consumer prices for energy since mid-2021 has made it clear that a renewables-based energy supply is not just good for the climate but also reduces energy costs and energy dependency (Figure 1).

Figure 1: Energy prices have risen strongly since mid-2021



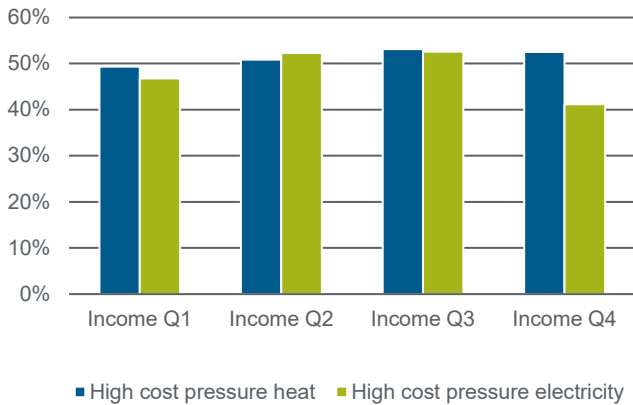
Source: Federal Statistical Office, own rendition.

The effects were initially driven by the economic recovery and intensified as a result of Russia's attack on Ukraine on 24 February 2022, which also dramatically changed the geopolitical landscape and placed a question mark over Germany's supply security. Heating oil is typically purchased without supply agreements, so that the increased prices have flowed directly through to consumers. Consumer prices for natural gas take significantly longer to change because of binding longer-term contracts. As a result, only a small part of the impact of the current gas crisis has flowed through to households so far – especially under soon-to-end contracts. Now, however, the gas shortage allows energy suppliers to increase prices, so that gas bills are likely to rise significantly for many households this winter.

This is all the more critical as around half of households (52%) were already experiencing high or very high prices for heating already before the war in

Ukraine. For electricity, that share is a slightly lower 48%.

Figure 2: Many households experienced cost pressure for energy already before the war in Ukraine



Source: KfW Energy Transition Barometer.

There is little difference in the cost pressure experienced by households of different financial capacity (Figure 2). However, the responses given by households reflect only the energy price increases up to the beginning of 2022. Energy costs were already significantly higher at that time (Figure 1), accompanied by corresponding media attention. Additional costs for heating, for example, were estimated to average around EUR 300 per year for a family of four.¹

Studies now predict additional costs of several thousand euros for a family of four with gas heating.² But because of the way contracts and invoices are structured, these cost increases are not expected to flow through to households immediately. The impact on households from the imminent price increases is therefore likely to increase significantly. The cost pressure already experienced before the current gas crisis will therefore likely intensify considerably once again in the coming months.

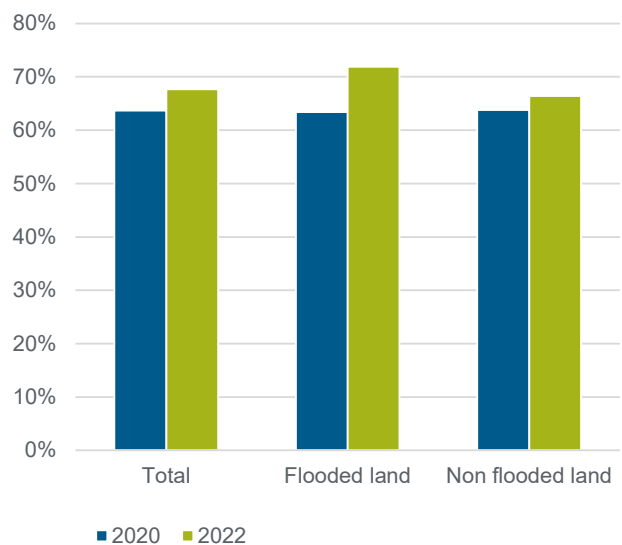
The impacts of climate change are also highlighting the importance of climate action

Year after year, public awareness that climate change is also having physical effects is growing more strongly. These include periods of severe drought, such as in Italy in 2022, as well as devastating flood events from heavy rainfall. The flash flood ‘Bernd’ alone claimed more than 180 lives and caused damage in excess of EUR 8 billion in Germany in July 2021.³

Climate change has made such events more likely.⁴ The reason is that climate change is not just leading to

higher average temperatures but exacerbating the risk of extreme weather events.⁵ A large portion of households are already experiencing this. Under the survey conducted for the KfW Energy Transition Barometer 2022, around 68% of households responded that they were already experiencing or feared adverse impacts from climate change in the future, slightly more than two years ago (64%) (Figure 3).⁶ The proportion of these respondents increased the most in the federal states hit particularly hard by the flood of 2021 (from 63 to 72%), but the rate of households experiencing impacts is also well over 60% in the remaining regions of Germany.

Figure 3: Climate change impact experienced



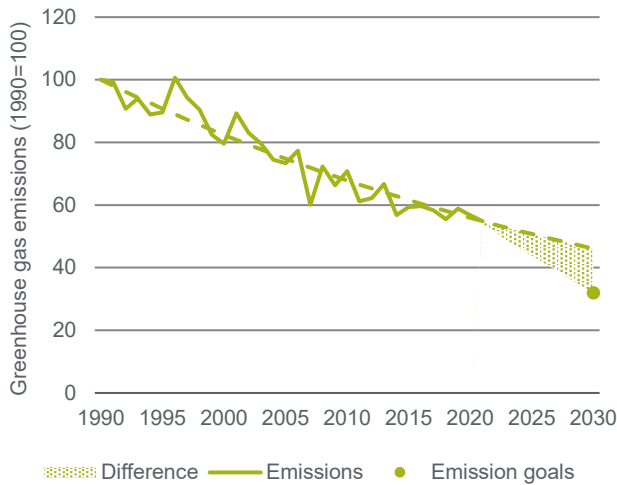
Note: Flooded land comprises the federal states North Rhine Westphalia and Rhineland Palatinate, which were particularly affected by the flood of July 2021.

Source: Römer and Salzgeber (2022).

The risk of abrupt and irreversible consequences for the earth’s climate (tipping points) also rises with increasing global warming.⁷ That is why the goal of limiting global warming to well below 2°C was formulated at the UN Climate Summit in Paris. Households can make the greatest contributions to lowering greenhouse gas emissions in Germany in the transport and building sectors. But achieving the Paris climate targets will require significantly more greenhouse gas reductions in the future than in the past decades.⁸

Despite all progress made, the reduction targets in the building sector have been missed for the second time in a row, albeit by only a thin margin (Figure 4).⁹

Figure 4: Greenhouse gas reduction in the building sector



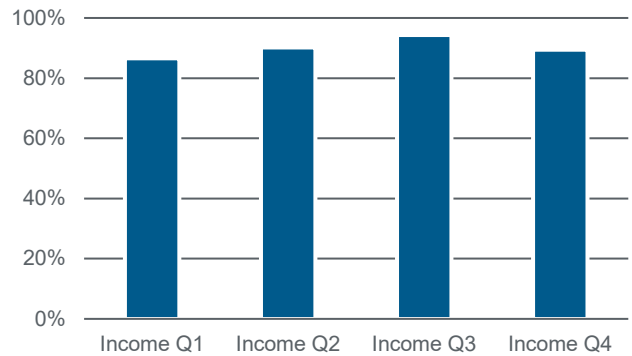
Source: German Environment Agency

Since 1990, GHG emissions in the building sector have been reduced by an average 3 million tonnes CO₂ equivalents each year but annual savings will need to rise to 5.3 million tonnes CO₂ equivalents by 2030 if the climate targets are to be met. That is nearly twice the current rate of reduction. Accelerating the energy transition therefore remains urgent from the perspective of the climate targets in Germany as well. The dictate of the hour, hence, is to take systematic action in both consuming and generating energy from renewable energy sources that are independent of critical import countries. That makes the energy transition more urgent than ever, not just for ecological but also for economic and political reasons, and households can make an important contribution to its success.

Households are very supportive of the energy transition and increasingly regard it as important

It is therefore positive that households continue to be very supportive of the energy transition. In the survey conducted for the KfW Energy Transition Barometer 2022, 89% of households responded that they regarded the energy transition as very important, 7% saw it as less important and only 4% believed it was unimportant. There appears to be broad public approval of the energy transition across all regions and population groups in Germany. In all regions, well over 80% and in some even more than 90% regard the energy transition as very important. The same is evident across different income groups (Figure 5).

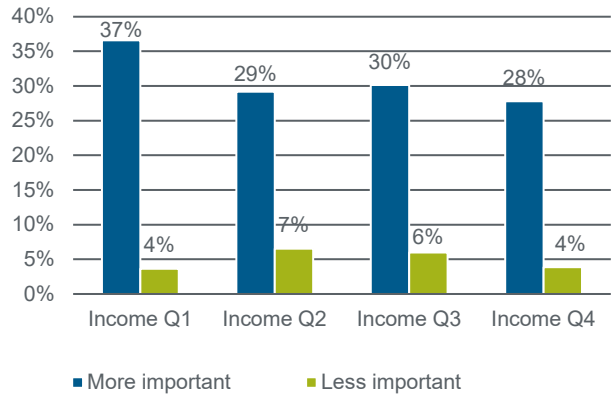
Figure 5: Strong support for the energy transition



Source: KfW Energy Transition Barometer.

At the same time, the energy transition has actually gained significance for many households. On average, 30% of households reported that the energy transition became more important for them in the past year while just under 6% now see it as less important. These findings are noteworthy and show an even sharper change over the previous year, when only around 10% of households saw the energy transition as having gained importance and a similar share of around 6% regarded it as less important.

Figure 6: Energy transition is becoming more important for many households



Source: KfW Energy Transition Barometer.

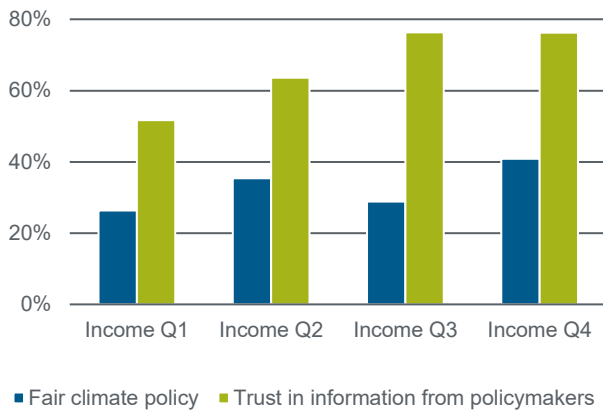
This increase in importance can be measured in all population groups and regions of the country. Along income lines, the importance attributed to the energy transition has increased slightly disproportionately in the group of households with the lowest incomes (Figure 6).

There are doubts about the social fairness of the energy transition

The broad support and growing importance given to the energy transition are crucial for the social cohesion without which such an all-encompassing endeavour cannot be implemented successfully. The positive sentiment is all the more remarkable as the burdens from rising energy prices for households are now clearly visible.

Another aspect of social acceptance is public confidence that a solution will be found which is fair for all groups of society. Households are much less convinced of this. Just under one third (32%) believe policymakers are working on such a fair solution. A good two thirds of households have doubts about the fairness of the energy transition.

Figure 7: Doubts exist about a fair solution for all



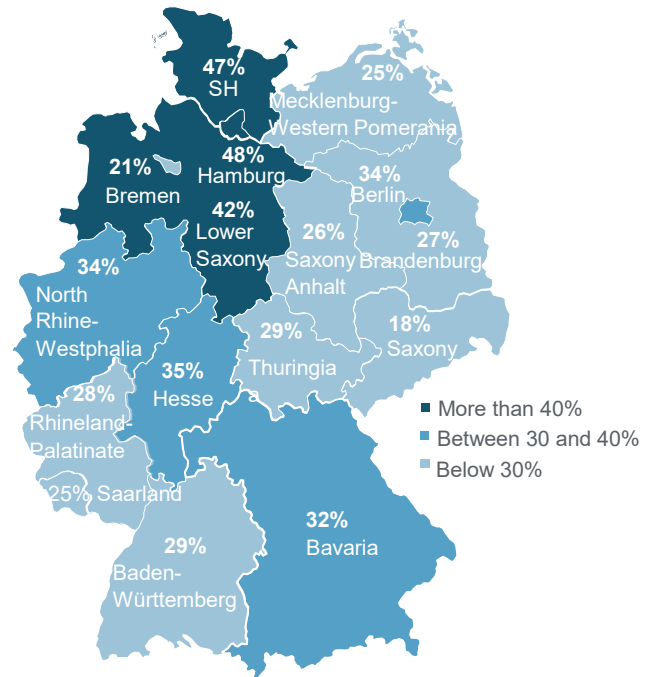
Source: KfW Energy Transition Barometer

One could treat this as sober realism, especially since this view does not appear to have any negative effects on the high approval of the energy transition. It must be considered, however, that these doubts are being entertained especially by low-income households. Only one quarter of them expect a fair solution for all groups of society, while that share is around 40% in the highest income quartile (Figure 7).

At the same time, there are noticeable differences in perception between individual federal states (Figure 8). Confidence levels are particularly low in eastern and south-western Germany, while views in northern Germany are significantly more optimistic.

Figure 8: Agreement that energy transition will seek to distribute burdens fairly across all groups

Source: KfW Energy Transition Barometer



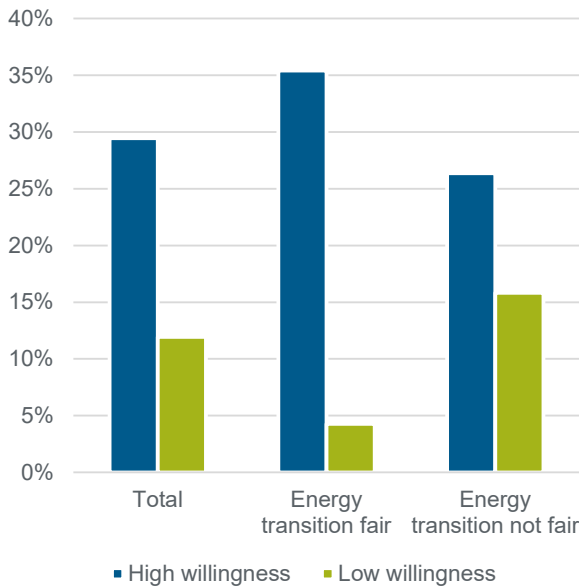
This trend is confirmed by a somewhat more generally formulated question about confidence in policymakers. Only around half of low-income households trust the information they receive from policymakers (52%).¹⁰ By contrast, around three quarters (76%) of households in the two upper income quartiles trust policymakers. Overall, around two thirds (65%) of households in Germany trust the information provided by policymakers.

Households that have confidence and believe in fair burden sharing are more willing to play a part

The differences with regard to policymakers also affect households' willingness to contribute to the energy transition themselves. On a scale from zero (no willingness) to ten (very high willingness), the average stands at 6.1. But households that believe in a fair distribution of burdens are much more willing to contribute (6.8) than those who do not believe burdens will be shared equally (5.8).

Conversely, around 35% of households that believe in a fair energy transition have a high willingness to act (8 or higher), while only 4% have a low willingness to act (3 or lower). Of those who do not believe the transition will be fair, only 26% have a high willingness to take action, while 16% have a low willingness to act (Figure 9).

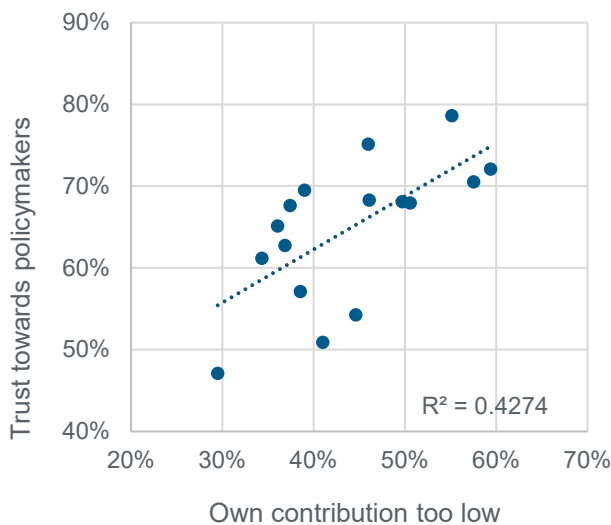
Figure 9: The more households believe in fair burden sharing, the more willing they are to act



Source: KfW Energy Transition Barometer.

A similar correlation is evident for the level of trust which households have towards information received from policymakers. Thus, the average share of households that believe their own contribution to the energy transition is still too low is higher in federal states where trust towards information from policymakers is also higher on average (Figure 10). Therefore, perceived fairness and trust towards policymakers are two parameters that need to be borne in mind in the energy transition to secure a high rate of approval and willingness to act from households.

Figure 10: Willingness to act is higher where trust towards policymakers is higher

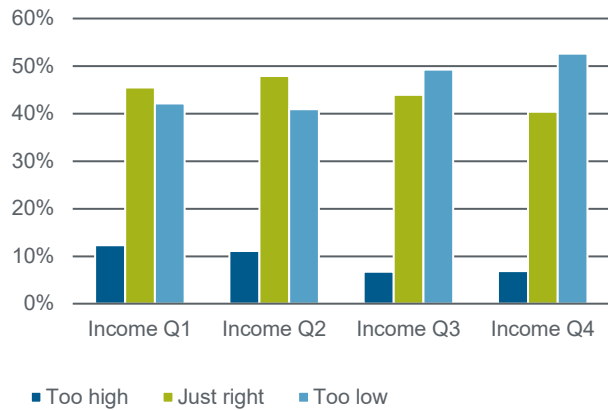


Source: KfW Energy Transition Barometer.

There is scope for improving social equity

When asked about the adequacy of their own contribution to the energy transition, households expressed a general readiness to contribute more, especially those on higher incomes (Figure 11), more than 50% of which see their own contribution as insufficient.

Figure 11: Households are willing to contribute more



Source: KfW Energy Transition Barometer.

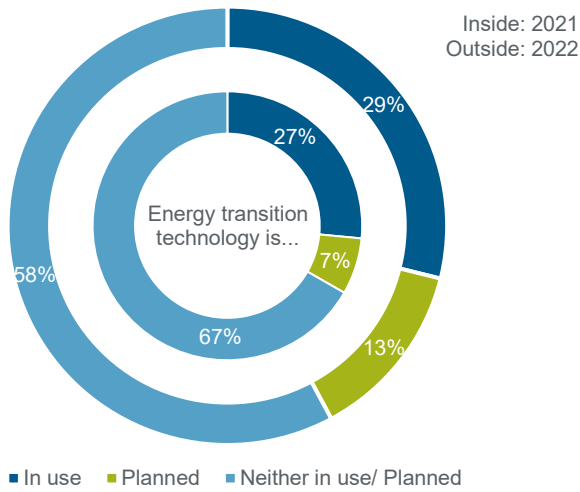
In summary, on the one hand the mood in the population points toward continuing high support for the energy transition. On the other hand, however, the findings also indicate that low-income groups in particular have misgivings that could intensify as a result of further energy price increases. It is therefore important to involve all groups of the population, as well as to continue strengthening the technologies required for a net-zero future and, in particular, enable greater use by the broader population.

Strong growth in the planned use of energy transition technologies

The use of energy transition technologies is growing. In the KfW Energy Transition Barometer 2021, 26.5% of households still responded that they were already using at least one of the energy transition technologies surveyed (photovoltaic solar energy, solar thermal energy, battery storage, heat pumps, combined heat and power, wood pellet heating, electric car). Today that figure already stands at 29% (Figure 12). This represents a relative increase of around 10%.

For the future, however, stronger growth is on the cards. Thus, 13% of households plan to acquire such technologies in the coming 12 months. That is the highest share recorded thus far under the Energy Transition Barometer and would increase the share of energy transition stakeholders by 50%.

Figure 12: Year-on-year increase in energy transition stakeholders



Note: The figure illustrates the shares of surveyed households that use at least one of the following technologies: photovoltaic solar energy, solar thermal energy, battery storage, heat pumps, combined heat and power, wood pellet heating, electric car.

Source: KfW Energy Transition Barometer.

Even if only around half the planned acquisitions were to be realised, as was the case in the past, it would mean a significantly higher increase in their use. And this is urgently needed because current greenhouse gas reductions are nowhere near sufficient to meet the 2030 targets.

Solar thermal power still tops the list, while PV systems are set to grow rapidly

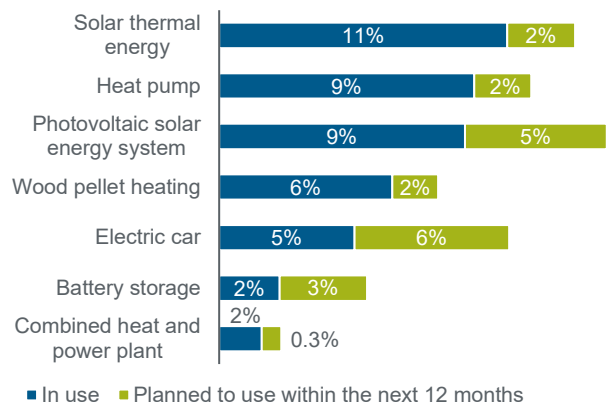
Among the energy transition technologies being implemented, solar thermal power continues to be most widespread (Figure 13). More than one in ten households have access to solar heating (10.6%), while a further 2.5% plan to buy a system in the next 12 months. Compared with the previous year (9.4%), that is an increase of more than one percentage point, or more than 10%.

Heat pumps are currently in second place and being used by 9.4% of households, an increase of approx. 10% on the previous year's rate of 8.7%. Here as well, further continuous growth of 2.1% is expected. The technology boasts high rates of use in new buildings but is being used even less than solar technologies in building modernisations.

PV systems are installed on 8.3% of household rooftops, a rate of distribution roughly equal to the previous year's. Given that sales of PV modules are on the rise, this rate needs clarifying. First, some modules are

likely replacing older ones that have been decommissioned. New acquisitions are also reported in the KfW Energy Transition Barometer: Around one in six users reported that their PV system was purchased the previous year. Second, around 2% of current users reported that they enlarged their system in the previous year. This permits the conclusion that existing systems were enlarged and technically upgraded and that these changes are not reflected in the share of energy transition stakeholders but nonetheless advance the energy transition.

Figure 13: Heat pumps in second place, electric vehicles expected to grow fastest

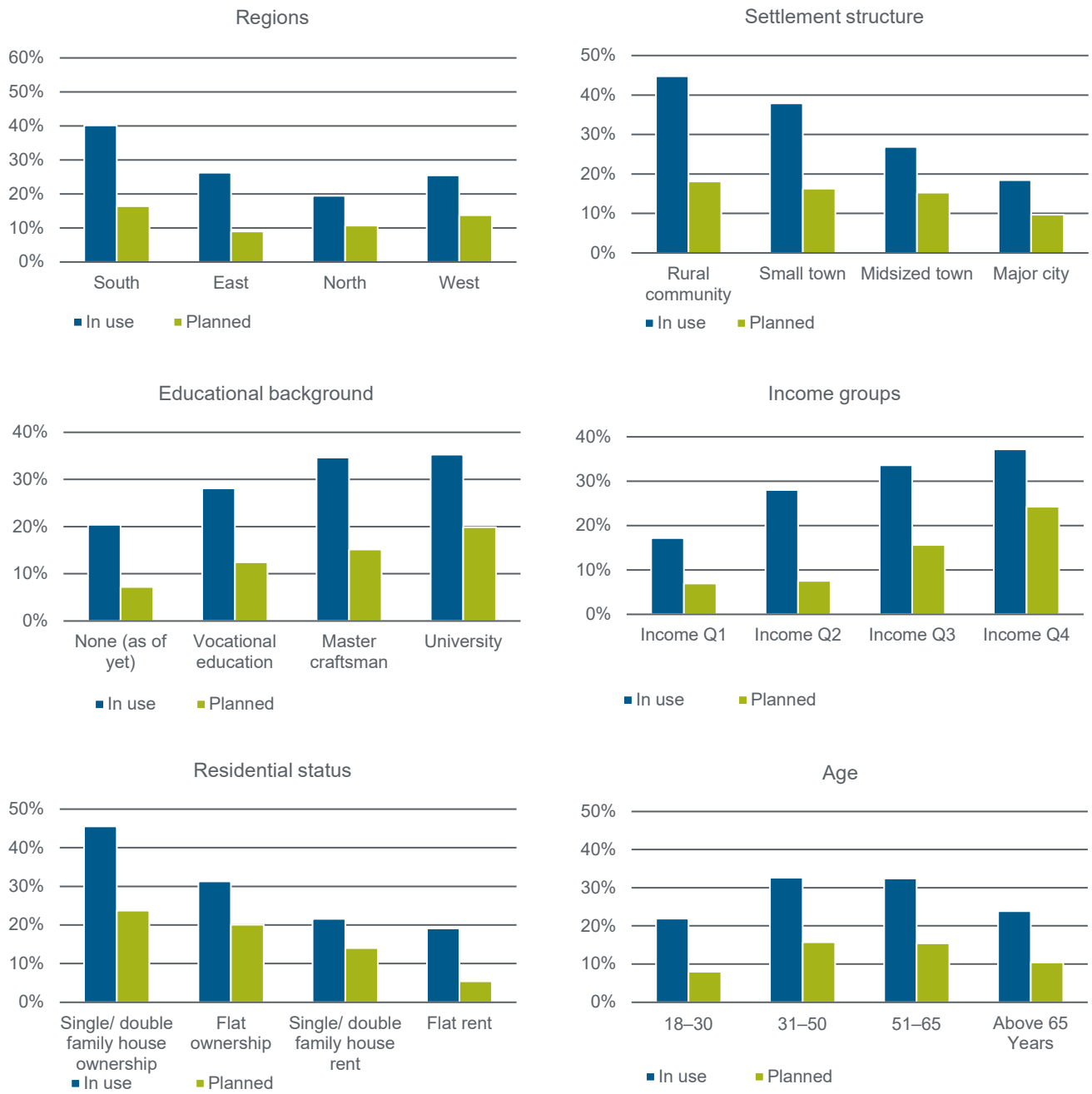


Source: KfW Energy Transition Barometer.

With a view to the future, the responses received from households demonstrate a fast-growing interest in solar electricity generation. The proportion of households planning to acquire a PV system in the next 12 months has reached a record high 5.2%. It is to be hoped that no supply bottlenecks or obstacles to approvals will stand in the way of this existing interest. The simplification of legal rules around tenants' electricity usage is therefore to be welcomed in any case.

In combination with rooftop electricity generation, households are showing particularly high interest in batteries and electric vehicles. Around 26% of users of photovoltaic systems plan to purchase a home battery (fewer than 1% of households without a PV system plan to do this). Twelve per cent of users of photovoltaic systems plan to purchase an electric vehicle (5% of non-PV users). These figures also illustrate that the technologies are mutually compatible and the incentives to use individual technologies are higher when other compatible technologies are already in place. Both the planning and the acquisition of energy transition technologies are very widespread among high-income households, in rural regions and among the group of homeowners (Figure 14).

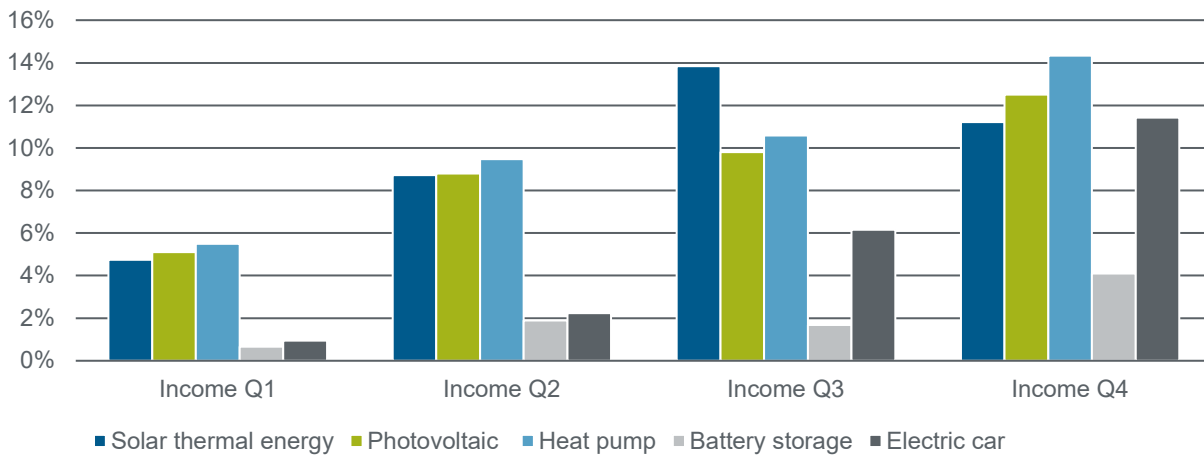
Figure 14: Use of energy transition technologies by different household characteristics



Note: The figure illustrates the shares of surveyed households that use at least one of the following technologies: photovoltaic solar energy, solar thermal energy, battery storage, heat pumps, combined heat and power, wood pellet heating, electric car.

Source: KfW Energy Transition Barometer.

Figure 15: Higher-income households are more likely to use energy transition technologies



Source: KfW Energy Transition Barometer.

Existing usage differences are threatening to widen

The use of energy transition technologies is particularly widespread among high-income households (Figure 15). The degree of usage rises continuously with income and is highest in the group of the highest incomes for all technologies under consideration.

What appears to be problematic here is that the planned acquisitions often show that the differences between the groups are widening. The highest income groups have the highest shares not only of today’s use but of the planned acquisitions (Figure 14). Even the relative increases are highest here, at +65%, compared with +44% for the lowest incomes.

The situation is similar with respect to the educational background. University graduates already have both the highest shares and the highest planned new acquisitions (+56%). The regional changes are slightly more even. In absolute terms, households in rural areas account for most of the existing and planned acquisitions, but the relative increase here is smaller than in the larger cities.

Also worthy of note is the fact that there is little movement in rental households. Here, the planned acquisitions are lowest in both absolute and relative terms. This observation could in part be explained by the fact that landlords announce planned acquisitions to tenants with a delay.

What characterises a typical energy transition stakeholder?

The descriptive findings were confirmed in a multi-variate analysis.¹¹ Thus, all else being equal, the likelihood of a household being an energy transition stakeholder rises with its willingness to take action and with its income. This applies to both existing and planned energy transition technologies (Figure 16).

Figure 16: Parameters that shape decisions on energy transition technologies

Energy transition technology...	exists	is planned
Willingness to act	↑	↑
Income	↑	↑
East		
South		
North		
Age	↓	↓
Owner		↑
Rural community	↑	
Small town	↑	↓
Medium-sized town	↑	↓
Energy cost pressure		↑
Used energy advice	↑	
Home insulation condition	↑	↑
Building age		
Unemployment rate		
New homes per inhabitant		
Debtor ratio		

Note: The above presents the findings of weighted logistic regressions in which the binary variables ‘Energy transition technology exists’ and ‘Acquisition planned’ are explained by the indicators listed in the left column. Statistically significant coefficients (at least to the 10% level) are marked by the coloured fields, with the arrow indicating the estimated direction of the correlation.

Source: KfW Energy Transition Barometer.

The more rural a household is, the more likely it is to have an energy transition technology installed. And the more urban it is, the less likely it is to be planning to acquire an energy transition technology. Thus, the urban/rural divide is also evident in the multivariate analysis, whereas there is nothing to indicate any specific regional effects.

The likelihood of a household having an energy transition technology installed is higher where they have received advice on the energy efficiency of their dwellings and/or were residing in well-insulated homes. The level of insulation is also a good predictor for the likelihood that a household will be planning to acquire an energy transition technology and the same applies to the cost pressure it is experiencing from energy prices. The age of the dwelling or regional structural indicators such as the unemployment rate, on the other hand, do not have a statistically measurable correlation with the probability of a household using energy transition technologies.

The currently experienced cost pressure has no statistically measurable effect on the existing use of energy transition technologies. This is plausible because the current events do not impact on past decisions. However, a glance at the data shows that past calculations are probably paying off in the current crisis. Thus, in the KfW Energy Transition Barometer the share of households complaining about the burden of high heating costs is slightly lower among those residing in well-insulated dwellings and/or are using an alternative heating technology (solar thermal energy, heat pump, combined heat and power, wood pellet heating). Again, this estimate is based on prices up to the beginning of the year 2022. The massive price increases from the summer of 2022 are not yet priced in here and are likely to further improve attitudes towards alternative heating sources.

The currently experienced cost pressure has an influence on the planned acquisition of energy transition technologies. This, too, is plausible because the more strongly households perceive cost risks in the current situation, the more attractive more price-independent (and climate-friendly) alternatives become simply for economic reasons. Already during the coronavirus crisis, households – especially those on lower incomes – exhibited a stronger interest in energy efficiency, although financial limitations hamper its realisation.¹² The current burdens from high energy and construction costs are likely to further exacerbate this dilemma.

The impact on households can thus be an important catalyst for stronger dynamics in the energy, heating

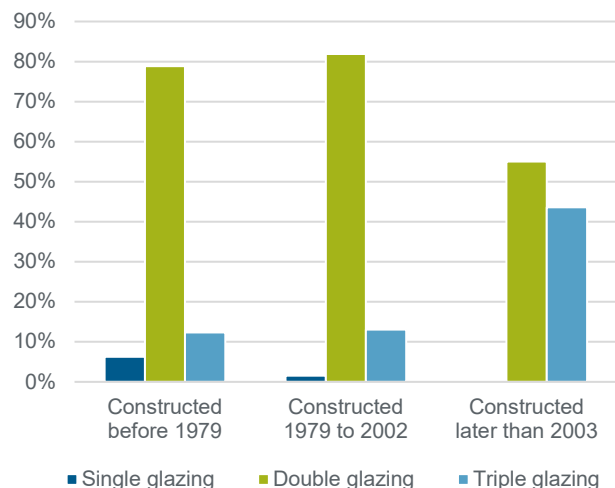
and mobility transition.¹³ Its success, however, will also depend on the creation of smart compensation and relief mechanisms in order to empower the neediest households in particular to play a role.

Great potential for energy-efficient refurbishment of buildings

The current energy crisis is shining a spotlight on the energy situation of residential buildings. Besides switching to renewables-based electricity and heating options, it is also necessary to reduce consumption by making buildings as energy-efficient as possible. Building shells also provide substantial optimisation potential. According to responses from households, only around 15% of dwellings are currently fitted with energy-efficient triple glazed windows, while nearly 5% of buildings still have single-glazed windows (Figure 17).

In particular, a disproportionately high share of older dwellings (6.3%) has single-glazed windows and a below-average share has triple-glazed windows (12%). Thus, upgrading windows remains a relatively easy way to improve the energy situation of many dwellings. However, triple-glazing also requires a building to be well insulated in order to prevent the buildup of mould. This is another area that offers abundant potential for improving the energy performance of existing buildings.

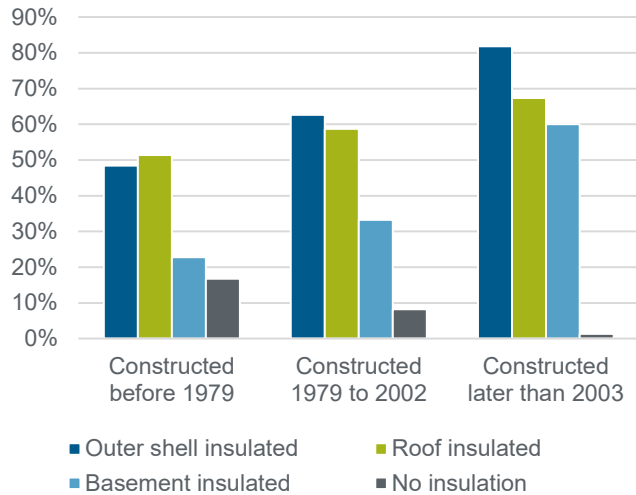
Figure 17: Most windows have double glazing



Source: KfW Energy Transition Barometer.

Older buildings are also much more poorly insulated (Figure 18). Thus, only around 50% of households residing in such buildings indicated that their basement or roof was insulated, with only 23% of households reporting an insulated basement ceiling. A full 17% of households residing in buildings erected in or before 1979 indicated that none of the three areas were insulated.

Figure 18: One in every six older buildings still without insulation



Source: KfW Energy Transition Barometer.

These figures might slightly underestimate the actual insulation situation, however, as tenants in particular do not always have detailed knowledge of the quality of insulation of the dwellings they reside in. In fact, tenants report significantly lower figures on insulation than owners. Another factor contributing to this difference is not just that owners have a strong interest in the energy situation of their properties, as many of them are energy transition stakeholders, but mainly the information deficit of tenants.

Nevertheless, there remains significant potential for owners to take action too. Even so, 9% of owners stated that none of the three surveyed areas of their

property had adequate insulation, only 39% reported having an insulated basement, and the figures for the outer shell (60%) and roof (77%) were also well below 100%. Refurbishing existing dwellings thus promises significant potential for reducing energy consumption in residential buildings.

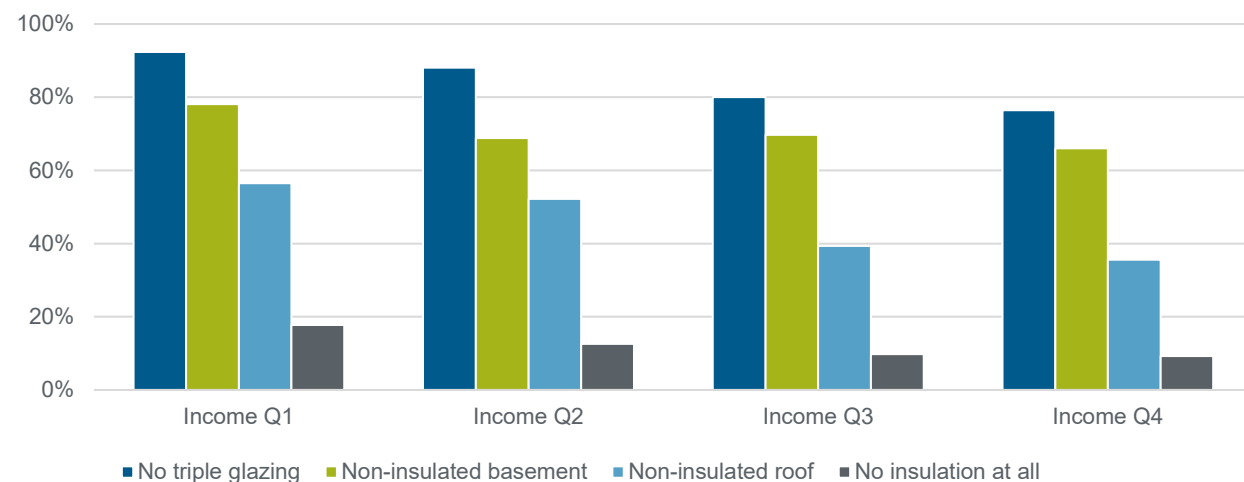
Households on low incomes on average have poorer insulation

With a view to building insulation, what is particularly critical is that lower income households tend to reside in more poorly insulated dwellings (Figure 19). Expressed in positive terms, this area in particular offers great potential for low-cost energy savings, for example with roof insulation.

One reason for this is the age distribution of dwellings. Thus, almost 75% of lowest-income households (bottom quartile) reside in buildings erected before 1979. Fewer than 50% of households on the highest income (top quartile) reside in such dwellings. On average, the dwellings in the lowest-income group (bottom quartile) are nearly 16 years older than those in the highest-income group of households (top quartile).

Low-income households are thus exposed to the current price effects on two fronts. First, their low incomes offer few options for mitigating the impact of high energy prices. Second, the energy situation of their buildings leads to higher consumption and, as a result, significantly higher ongoing costs. This also puts the lower average rent that can be charged for homes with a lower energy performance into perspective.¹⁴

Figure 19: Building shell has great potential for low-income households in particular

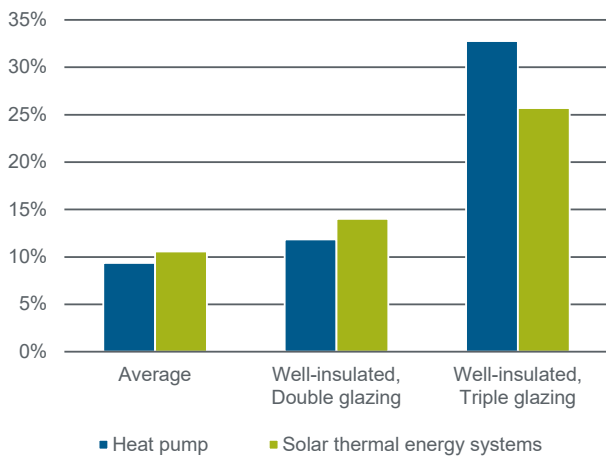


Source: KfW Energy Transition Barometer.

Combining energy transition technologies holds high potential as well

Particularly in well-insulated buildings, climate-friendly and renewable energy sources such as heat pumps or solar thermal energy for heating are obvious options, as a low-energy requirement can more easily be met with these alternatives to fossil energy sources. Here as well, the findings of the KfW Energy Transition Barometer 2022 show considerable scope for action. To be sure, households residing in well-insulated dwellings use significantly more heat pumps (33%) and solar thermal energy systems (26%) than the average (9% and 11%) (Figure 20).

Figure 20: High potential for combining energy transition technologies



Source: KfW Energy Transition Barometer.

Nevertheless, only around two thirds of households in the best-insulated dwellings already use a heat pump, solar thermal energy or combined heat and power, and that ratio drops to a total of just 28% in well-insulated

households with double glazing.¹⁵ To be sure, the share of technologies such as solar thermal energy or heat pumps will not amount to 100% of all well-insulated dwellings in the future either, for example because households use geothermal energy or are connected to a district heating system, which makes a conversion unnecessary or at least difficult. Nevertheless, the figures indicate considerable potential for switching from fossil energy sources to renewable heating sources.

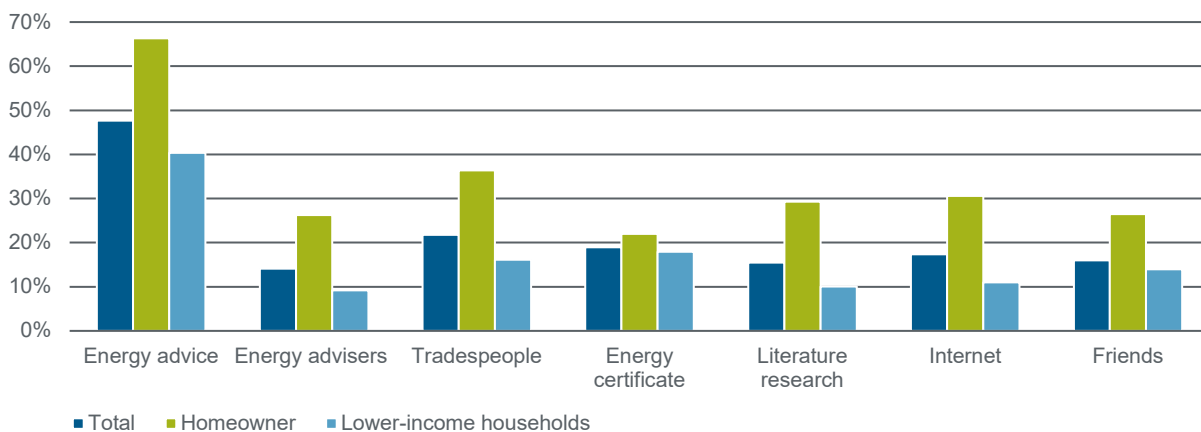
Property owners are more concerned with the energy situation of their dwellings than the average

Tips on what upgrading options or requirements a dwelling has can be obtained from an energy advisor or from a general inspection of the substance of the dwelling.

Under the KfW Energy Transition Barometer 2022, nearly 50% of the surveyed households indicated that they had concerned themselves with the energy situation of their unit or house in the past year (Figure 21, column Energy info). This is also likely to be a result of the burden which many households already experienced from heating and electricity costs during the survey period (see Figure 2). Property owners were more likely than average to address the energy situation of their property (66%), while households on below-average incomes were less likely than average to do so (40%).

What is noteworthy is that households drew on a broad range of information sources. Overall, the information sources used most often were tradespeople (22%) and energy certificates of buildings (19%). Energy advisers were used by 14% of households.

Figure 21: Income also plays a role in the request for energy advice



Source: KfW Energy Transition Barometer.

All other information sources lie between these values, although none of them stands out clearly from the others. This also applies to homeowners and households with below-average incomes. They use all information sources, although some differences in the relative importance are apparent.

Thus, the energy certificate, which is required in a tenancy arrangement, is the source of information used most frequently by lower-income households but the least used by property owners. Conversely, property owners consult energy advisers much more often than average, but households on below-average incomes are less likely than average to do so. All other information sources are also used more often than average by homeowners but less often than average by households on lower incomes.

These findings could be the result of higher requirements by property owners because after all, the incentive to upgrade one's own dwelling is greater than for a rental unit. But they could also point to the limited options which lower-income households have to make energy-efficiency upgrades or seek expert advice.

A key challenge of the energy transition will therefore be to enable as many potential households as possible to actively take measures to reduce their energy requirements and switch to climate-friendly energy sources.

Conclusion

The current gas crisis and the impact of climate change both make one thing clear: The energy transition is more urgent than ever – for ecological and economic reasons. Nearly 90% of households across all regions and population groups in Germany – a very high rate – support the energy transition. At the same time, there are concerns whether climate policy is able to achieve a fair distribution of burdens between all stakeholders. These reservations have the potential to adversely affect households' willingness to take action.

To be sure, the proportion of energy transition stakeholders increased on the previous year to around 29% of households. As before, however, households on high incomes are most likely to use energy transition technologies such as photovoltaics, solar thermal energy, battery storage, heat pumps, combined heat and power, wood pellet heating and electric vehicles. It is therefore necessary to continue reducing financial obstacles and information deficits so that these technologies, which are critical for the transformation to net zero, can be used by all groups of the population.¹⁶

The same applies to energy-efficient refurbishment of buildings. Dwellings account for around two thirds of private households' total energy consumption.¹⁷ Nearly 85% of households in Germany still heat their homes primarily with gas or heating oil.¹⁸ Reducing this high dependence on fossil energy sources will contribute to lowering greenhouse gas emissions and will reduce financial burdens on households.

The findings of the KfW Energy Transition Barometer indicate great potential in this area. For example, only around 15% of buildings currently have modern triple-glazed windows. Heating systems also have room for improvement. Not more than 33% of households residing in well-insulated dwellings use climate-friendly technologies such as solar thermal power or heat pumps for heating.

The path to a climate-friendly building sector thus includes maintaining a high energy efficiency level for new buildings, but most of all a quick and targeted modernisation of energy systems in existing properties. To achieve this, both the technical possibilities of the dwellings and the financial capacities of building owners need to be adequately taken into account. A strong need to catch up still exists in the area of rental housing in particular. All technical and contractual options need to be explored in order to leverage savings potentials.

These range from the heat pump to the district heating connection, from direct promotional loans to support for contracting firms and the reduction of regulatory barriers. There is still abundant potential in this regard. More than three fourths of rooftops do not have a photovoltaic or solar thermal system installed. The proportion of roof space still not utilised for photovoltaic solar power is as high as 87%. It is also necessary to be mindful of potential bottlenecks affecting energy advisers, construction firms, tradespeople and supply chains so that public support measures, for example, are not absorbed one-to-one by price increases.

As households on lower incomes are most likely to reside in poorly insulated dwellings, financial hurdles and information deficits affecting modernisation must be reduced here in particular. This can also help to dispel their doubts about an equitable energy transition and help to take broader sections of society on board in the future, which will not just prevent social tension but is essential to achieving the climate targets.

Policymakers are already addressing many of these points in their current initiatives and promotional programmes.¹⁹ They must focus on placing renewables in

a better position relative to fossil energy sources. This can be done through a high carbon price but also requires further components such as training for installers of the new technologies. There are also numerous ideas on addressing burdens from modernisation and energy costs, for instance in the form of a socially sustainable reimbursement of surplus revenues.²⁰

Supporting accompanying measures such as energy advice from experts can also make a valuable contribution and help to ensure that the technologies are installed not just more often but with greater efficiency and more in line with household needs.

In addition, particularly vulnerable households should benefit from the measures. A wide range of supported advisory services is already available.²¹ It must be examined why these are possibly not being used and whether sufficient advisory capacity is available to provide broad support to the population.

Ultimately, a key prerequisite for success is that all groups of the population can have a stake in the energy transition and that mechanisms are developed that allow a fair distribution of the associated burdens. First, associated compensation mechanisms should not dilute the pricing signals for fossil energy sources but rather be in the form of lump-sum transfers, particularly for low-income groups that carry a particularly heavy burden. Second, they must be easily identifiable for the population. Direct compensation payments, for example, are more readily perceivable than indirect relief in the form of tax reductions or subsidies.²² Furthermore, relief must also be communicated transparently and accepted by the population. Considerable potential for improvement still remains in this regard.²³ After all, the only way for the energy transition to be successful in households is when it enjoys high public acceptance and generates a high willingness to make changes.

Box: KfW Energy Transition Barometer

The KfW Energy Transition Barometer is a study conducted annually since 2018 on the basis of a survey of a random sample of some 4,000 representative households in Germany. Responses from each household were received from one household member of full age who takes decisions on household energy supply and consumption. The aim of the survey was to find out to what extent energy transition technologies are being used in the different households. The survey also covered any planned use in order to estimate in what areas the greatest growth was to be expected. Taken together, the surveyed data provide an overview of current sentiment and households' participation in the energy transition in Germany.

The field phase of the Energy Transition Barometer 2022 comprised around seven field weeks from 6 December 2021 to 23 December 2021 and from 3 January 2022 to 29 January 2022.

Further information on the structure of the current survey of the KfW Energy Transition Barometer can be taken from the related Volume of tables and methods: www.kfw.de/energiewendebarmeter (in German only).

¹ Cf. 'Winter wird für Heizkunden sehr teuer': Haushalte zahlen für Heizöl fast das Doppelte als vor einem Jahr (Winter will be very costly for heating customers – households are paying almost double for heating oil than a year ago – our title translation, in German) - Wirtschaft - Tagesspiegel

² A study by the management consultancy Oliver Wyman expects additional costs of EUR 2,900 per year for a family of four, cf. Oliver Wyman (2022): Der Preis der Unabhängigkeit (The price of independence – our title translation, in German). The German Federation of Housing Management sees an even stronger cost increase from EUR 1,818 to EUR 5,074. Cf. Hohe Gaspreise: Wie stark die Nebenkosten steigen können (High gas prices: how much ancillary costs can rise – our title translation, in German) (faz.net).

³ Cf. German Federation of Housing Management (2022): Nordrhein-Westfalen und Rheinland-Pfalz mit höchsten Unwetter-Schäden (North Rhine Westphalia and Rhineland Palatinate with greatest storm damage – our title translation, in German) (gdv.de).

⁴ An attribution study on the flood events of the year 2021 arrived at the conclusion that the probability of occurrence of such heavy rainfall events has risen by a factor of 1.2 to 9 as a result of climate change. Cf. Kreienkamp F. et al. (2021): Rapid attribution of heavy rainfall events leading to the severe flooding in Western Europe during July 2021, World Weather Attribution (WWA) Initiative.

⁵ Cf. Faktenpapier, as at September 2021: Was wir heute über das Extremwetter in Deutschland wissen (What we know today about extreme weather in Germany – our title translation, in German), published by Deutscher Wetterdienst and Extremwetterkongress Hamburg.

⁶ Cf. Römer, D. and Salzgeber, J. (2022): Extremwetterereignisse: versichert sein oder nicht sein, das ist hier die Frage (*Extreme weather events: to be insured or not insured, that is the question* – in German only). Focus on Economics No. 390, KfW Research.

⁷ Cf. Lenton, T. (2021): Tipping points in the climate system, *Weather* 76, p. 325–326.

⁸ Cf. Römer, D. and Steinbrecher, J. (2021): KfW Energy Transition Barometer 2021 (*KfW Energy Turnaround Barometer 2021* - in German only), KfW Research.

⁹ Cf. joint press release by German Environment Agency and Federal Ministry for Economic Affairs and Climate Action: Greenhouse gas emissions rose by 4.5 percent in 2021.

¹⁰ Confidence is measured on a scale from 0 (no confidence at all) to 10 (full confidence). The classification 'confidence in policymakers' used here reflects responses of at least 5 or higher to the question of how much confidence households have in information received from policymakers.

¹¹ As some of the observed variables are not independent from one another but likely to mutually influence each other, such as income and ownership status, the household characteristics are jointly investigated in a multivariate analysis. To this end, the binary variable 'energy transition technology exists' (yes/no) and 'energy transition technology planned' (yes/no) is explained by the structural indicators presented in Figure 13.

¹² Cf. Römer, D. and Steinbrecher, J. (2021): Hohe Zustimmung zur Energiewende trotz Corona – Energieeffizienzwünsche treffen allerdings auf finanzielle Hindernisse (*Energy transition broadly welcomed despite coronavirus – but energy efficiency preferences are facing financial obstacles* – in German only), Focus on Economics No. 334, KfW Research.

¹³ Thus, the mobility transition also demonstrates that households are more willing to accept changes and policy measures the more they are affected by motorised traffic themselves. Cf. Römer, D. and Steinbrecher, J. (2021): Zustimmung zur Mobilitätswende steigt mit der Betroffenheit durch den Verkehr (*People impacted by traffic more likely to support mobility transition* – in German only), Focus on Economics No. 310, KfW Research.

¹⁴ Building characteristics such as age or thermal insulation properties therefore lead to potential rent increases or reductions. Buildings with poorer characteristics therefore tend to be more affordable (without utility expenses). Hinweise zur Integration der energetischen Beschaffenheit und Ausstattung von Wohnraum in Mietspiegeln (bund.de). (*Explanations on integrating energy characteristics and equipment of dwellings into rent indexes* – our title translation, in German)

¹⁵ Wood pellet heating systems cannot be directly added or imputed as they can also be used as a small secondary heat source in buildings with a heat pump.

¹⁶ Technologies currently being used on a relatively small scale only, such as geothermal energy and ice storage, can also contribute to the heating transition. It should be examined where these technologies can be deployed and what can be done to lift them out of their niche in suitable areas of application.

¹⁷ Cf. German Federal Statistical Office (2021): Datenreport 2021 - Kapitel 13: Umwelt, Energie und Mobilität. (*Data report 2021 – Chapter 13: Environment, energy and mobility* – our title translation, in German)

¹⁸ Cf. Federal Statistical Office (2019): Einkommens- und Verbrauchsstichprobe Wohnverhältnisse privater Haushalte 2018 (*Income and consumption sample, Housing situation of households in 2018* – our title translation, in German), Fachserie 15 Sonderheft 1.

¹⁹ Cf. Press release by the Ministry for Economic Affairs and Climate Action (BMWK) and the Federal Ministry for Housing, Urban Development and Building (BMWSB) dated 13 July 2022: BMWK und BMWSB legen Sofortprogramm mit Klimaschutzmaßnahmen für den Gebäudesektor vor (*BMWK and BMWSB launch emergency programme with climate measures for the building sector* – our title translation, in German).

²⁰ Cf. Schwartz, M. (2022): Die Antworten auf den Energiepreisschock in eine Klimaschutzstrategie einbetten (*Embedding the responses to the energy price shock into a climate action strategy* – in German only). Focus on Economics No. 385, KfW Research.

²¹ Cf. For example, energy advice is supported by the Consumer Advice Centre through the BMWK. This advice costs not more than EUR 30 and is free of charge for low-income households. Cf. BMWK - Deutschland macht's effizient (*BMWK - Germany does it efficiently* – our title translation, in German).

²² Cf. Schwarz, M. (2022): loc. cit.

²³ Recent surveys indicate that a large portion of the population is unable to follow how relief measures should work or do not feel any relief even though measures worth billions have already been adopted. Cf. RTL/ntv-Trendbarometer: Nur wenige fühlen sich von Ampel-Maßnahmen wirklich entlastet (*Only few feel any real relief from Coalition measures* – our title translation, in German) - *n-tv.de*.