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»»» KfW Climate Barometer 2023

Climate investments by German enterprises grew by 18% in real terms in 2022 – despite the energy crisis

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Climate investments by German enterprises grew by 18% in real terms in 2022 – despite the energy crisis

The KfW Climate Barometer, which is published for the second time this year, provides insights into the attitudes and activities of German businesses around the topics of climate action and energy transition. It is the only representative database covering investment behaviour on the road to climate neutrality across the entire business sector in Germany. The most important findings of the KfW Climate Barometer 2023 at a glance:

Progress in strategic integration

Nearly two thirds of all businesses in Germany have now at least partly enshrined climate action in their corporate strategy. That was 10 percentage points more than in the previous year. SMEs were able to make up for lost ground on large enterprises, which already demonstrated a significantly higher level of activity in this area in the previous year. However, there is still potential for operationalising climate action strategies in businesses' specific greenhouse gas reduction plans. Around 70% of businesses, particularly small and medium SMEs, still have not developed any concrete plans.

So far, only few enterprises have a climate neutrality goal of their own

A clear majority of around 60% of enterprises at least partly support Germany's goal of becoming climate neutral. So far, only few businesses have a climate neutrality goal of their own but that share also grew noticeably from 10% in the previous year to 15%. Larger enterprises are at the forefront, and at sector level, manufacturers are leading the way.

Climate investment has increased significantly

Despite the economic uncertainties caused by the energy crisis, investment by German enterprises in domestic climate action grew by a noteworthy 31% (in nominal terms) to a total of EUR 72 billion in the year 2022. This investment growth remains even after accounting for inflation. Adjusted for prices, the growth rate was 18%. That means around one in seven euros (15%) invested in the business sector in 2022 was allocated to climate action investments. A likely important factor for this development was the strong increase in fossil fuel prices, which made investments in energy efficiency and the use of renewables more attractive. Pull-forward effects resulting from the foreseeable increases in the cost of debt capital and rising prices for capital goods are likely to have boosted investment activity as well, particularly in the first half of 2022. The investments were evenly split between SMEs and large enterprises.

Businesses invested most frequently in green mobility, followed by the expansion of renewables and measures aimed at making existing buildings energy efficient.

Reaching net zero continues to require significant additional investment

The welcome growth in climate investment last year shows that climate action is already on the agenda of many businesses. To be sure, the investment gap to the estimated approx. EUR 120 billion that needs to be invested by the corporate sector each year in order for Germany to become climate neutral by the middle of the century shrank substantially last year. However, investment will have to be increased significantly yet again.

Businesses funded climate action investments mostly from own resources

Most of the climate investments made by businesses were funded from own resources (between 42% in the segment of micro-businesses to 91% in large enterprises). SMEs used bank loans and promotional funds more often than large enterprises to finance their projects. Credit financing by SMEs in particular became more important compared with the previous year.

Uncertainty on cost-effectiveness and financial aspects were the greatest barriers to investment

The most urgent obstacles to investment were uncertainty on the cost-effectiveness of climate investments and lack of financial resources. The latter became even more important than in the previous year. A reliable and projectably rising carbon price signal and the provision of an adequate financing and support framework are therefore important levers for facilitating the necessary investments. Difficulties in sourcing climate technologies, skilled labour shortages and insufficient information – especially in the SME sector – also need to be addressed.

Energy crisis is adding urgency to the green transformation

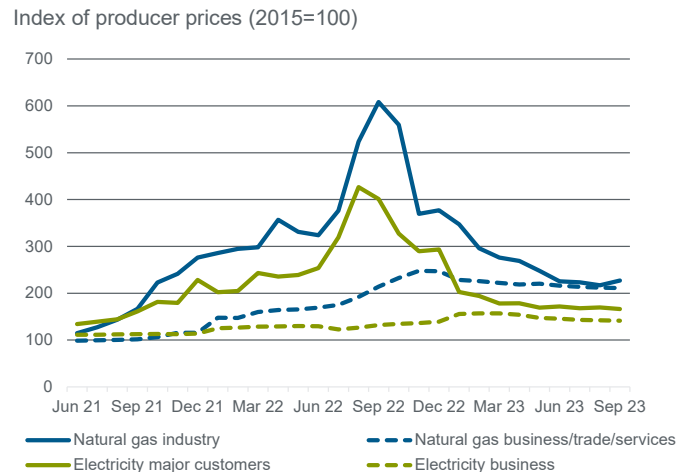
The German economy is currently in a difficult economic environment that is mainly driven by the after-effects of the energy price crisis, inflation-induced cost and price pressure, higher financing costs as a result of monetary tightening, as well as weak global economic development. In this, Russia's war of aggression on Ukraine, in the course of which Russian pipeline gas deliveries to Germany were first reduced substantially and then halted completely from September 2022, marks a turning point in Germany's energy supply. Before the war in Ukraine, more than half the natural gas consumed in the country came from Russia.¹ Germany's natural gas supply had to be put on a new foundation within a matter of months.

Germany has so far made it through the energy crisis with a black eye. Last winter the country was able to prevent a gas shortage by diversifying procurement sources and sharply reducing consumption in businesses and households, as well as thanks to mild weather conditions. The development of an LNG import infrastructure at German ports is intended to secure Germany's gas supplies for the long term. With a view to the coming winter, however, vigilance is still called for. Acts of sabotage or damage to European natural gas infrastructure, unforeseen cold spells or a stop of all natural gas supplies from Russia to Europe could make the supply situation more difficult again. It therefore remains important to continue using gas sparingly.²

Looming gas supply shortages caused prices in the natural gas and electricity markets to skyrocket last year. This year, gas and electricity prices have come down considerably from their 2022 peaks but are still above the level before the beginning of the energy price crisis of the second half of 2021 (Figure 1).³ This is putting great pressure primarily on energy-intensive businesses and weakening their international competitiveness.

Risks from one-sided high dependencies on fossil fuel imports as well as the changed price path of natural gas have raised the urgency of the green transformation. In response to the energy crisis, both Germany and the EU introduced a range of measures aimed at accelerating the energy transition, such as the REPowerEU Plan. The massive expansion of renewables and systematic advancement of energy efficiency are now also regarded as key strategies for more energy security in Europe and energy affordability that aim to pave the way towards climate neutrality at the same time.

Figure 1: Development of energy prices in Germany



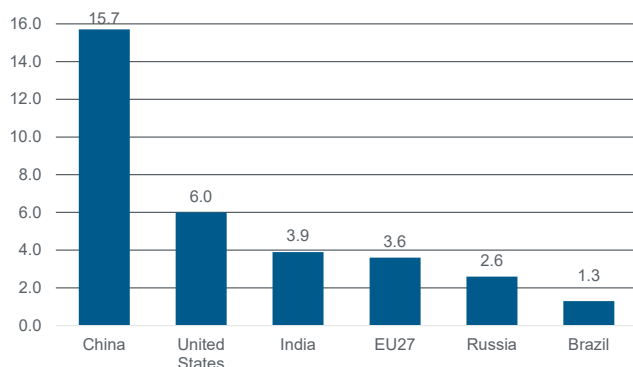
Source: German Federal Statistical Office (2023)

Accelerating global climate change is also creating urgency to act

Heatwaves, droughts, heavy rainfall – it is impossible to ignore the effects of climate change around the world, and in Germany. Hardly a year passes without new temperature records being broken. Extreme weather events are becoming more frequent and more intense. The recently published IPCC Synthesis Report makes it clear: The warming of the Earth poses a threat to the natural bases of human life and to economic activity. Every one tenth of a degree of additional warming leads to a quick escalation of the dangers from climate change. The UN Climate Change Conference (COP28) in Dubai in December 2023 has aimed to take stock of the climate efforts so far undertaken. What is already clear is that global decarbonisation is progressing too slowly to be able to achieve the climate targets set under the Paris Agreement in 2015. It now appears very unlikely that the global temperature increase can be limited to 1.5°C above pre-industrial levels (increase by 2022: +1.2°C). According to the World Meteorological Organisation WMO, there is a 66% probability that the 1.5°C heat threshold will be breached at least once between 2023 and 2027. Furthermore, the global climate measures thus far agreed upon are not nearly ambitious enough to at least meet the 2°C target. Above 2°C of global warming, a reasonably orderly adaptation to the consequences of climate change is regarded as nearly impossible. According to the United Nations Environment Programme (UNEP), current policies are putting the world on a path to 2.8°C by the end of the century unless additional measures are adopted.⁴ The international community must raise its level of ambition and systematically implement measures already agreed in order to meet the target. As the world's fourth-largest emitter of greenhouse gas emissions, the EU27 has a key responsibility as well (Figure 2).

Figure 2: The world's six largest greenhouse gas emitters in 2022

In billions of tonnes of CO₂ equivalents



Source: European Commission (2023)

KfW Climate Barometer gives insights into the activities of German businesses on the road to climate neutrality

In order to make an effective contribution to the fight against global climate change, Germany has committed to reducing its greenhouse gas emissions by 65% compared with the 1990 baseline by the year 2030 (situation in 2022: -40.4%) and become climate neutral by 2045. To be able to meet this target, it will need to mobilise EUR 5 trillion in climate-friendly investments by the middle of the century (study of 2021).⁵ If this sum is spread out over the years remaining until 2045, the country will need to invest EUR 190 billion, or 5% of its GDP, on average each year, along with any price variations accruing in the course of time. A large portion of this investment – around 60% – will have to come from the corporate sector. This figure illustrates that Germany cannot become climate neutral without a green transformation of its economy.

The KfW Climate Barometer, which is published for the second time this year, provides insights into the attitudes and activities of German firms around the topics of climate action and energy transition. The annual tracking survey is thus far the only representative database for the investment behaviour of all German businesses – from micro-businesses to large enter-

prises – on the road to climate neutrality (see Box 1 for business size classes).

This year's survey focuses on advances which businesses have made in integrating climate action into their corporate strategy, the effects of the energy price crisis on businesses' climate action investments, and practical barriers standing in the way of the green transformation. Around 11,500 businesses took part in the survey, which was conducted between 6 February 2023 and 16 June 2023. More details about the structure of the KfW Climate Barometer can be found at the end of this report (Box 5).

Box 1: Size classes used

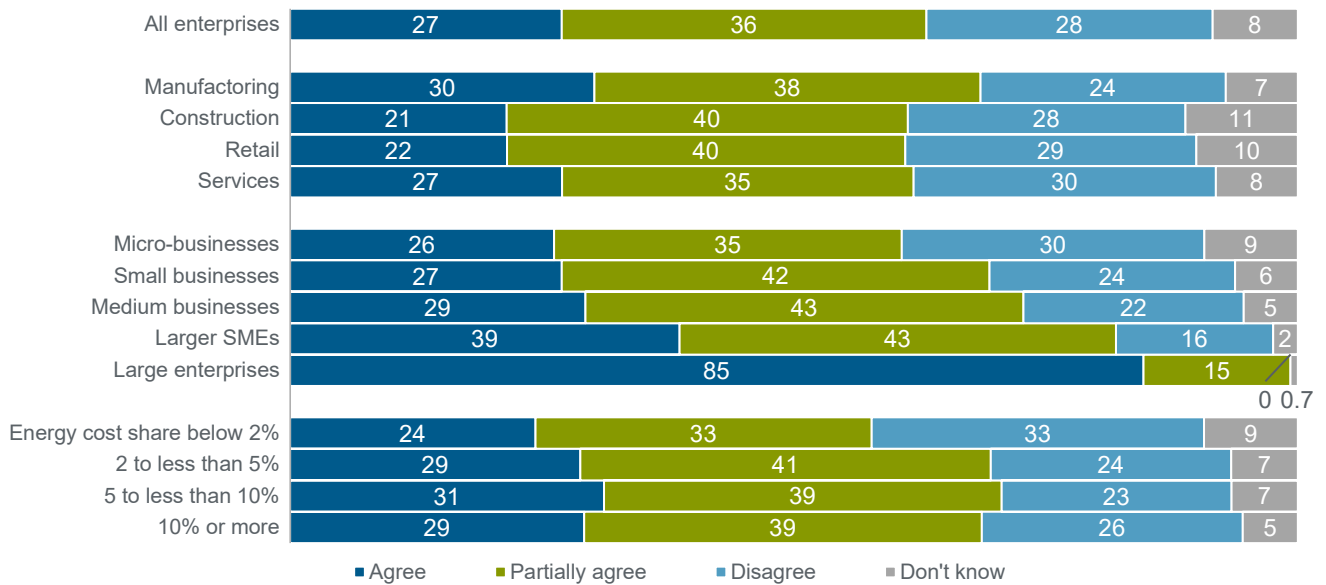
The KfW Climate Barometer divides businesses into five different size classes. These are defined as follows: **Micro-enterprises** have fewer than five employees. **Small enterprises** have five to nine employees. **Medium enterprises** are defined as those that have ten to 49 employees. Companies with 50 and more employees are referred to as **larger SMEs** – provided their annual turnover does not exceed EUR 500 million. This turnover threshold applies analogously to all smaller size classes. Accordingly, **large enterprises** are defined as companies with an annual turnover exceeding EUR 500 million; their headcount does not play a role, however. In the following, only these designations will be used for ease of reading. Where the **SME sector** is additionally referred to as a collective, it comprises the first four size classes (i.e. the entire business sector not including large enterprises).

Almost two thirds of businesses are taking climate action into account in their business strategy

Decarbonisation has gained in strategic importance for many businesses in Germany. Nearly two thirds (63%) of all businesses in Germany have now at least partly enshrined climate action in their corporate strategy (Figure 3). That was 10 percentage points more than in last year's survey, when this was true of only around half of all businesses (53%).

Figure 3: Climate action as part of the business strategy

Shares of enterprises in per cent



Note: Specifically, the question was 'To what extent does the following statement on the issue of climate action apply to your business: Climate action is incorporated into our business strategy'. Energy cost share means the share in total costs incurred by the business.

Source: KfW Climate Barometer 2023

The proportion of enterprises that integrated climate action fully into their corporate strategy increased on the previous year (from 25 to 27%), as did the share of those that partly integrated it (up from 28 to 36%). At the same time, the share of companies that do not see climate action as part of their strategy fell from 40 to 28%. The trend is good news but also shows that awareness building is still very much an ongoing process.

The size of the company clearly influences the extent to which it incorporates climate action into its business strategy. The share of enterprises that incorporate climate action at least partly into their strategy is the smallest among micro-businesses, at 61%. That figure rises to 73% among medium-sized businesses, while almost all large enterprises – 99.3% – have dealt with the issue and 85% of them have even incorporated it fully into their strategy.

A positive is that smaller businesses in particular were able to catch up in the course of the year. Thus, the greatest increases in the incorporation of climate action occurred in micro-businesses (+12 percentage points) and small firms (+7 percentage points). This raises the hope that awareness can grow across the breadth of the sector.

Manufacturing is the sector in which companies have incorporated climate action most firmly. This is understandable because it is here in particular that the green

transformation is associated with substantial upheavals for many businesses. In order to be able to put climate-neutral business models in place, they must modify products (for example in the automotive industry) as well as production processes (for example in paper and steel production).

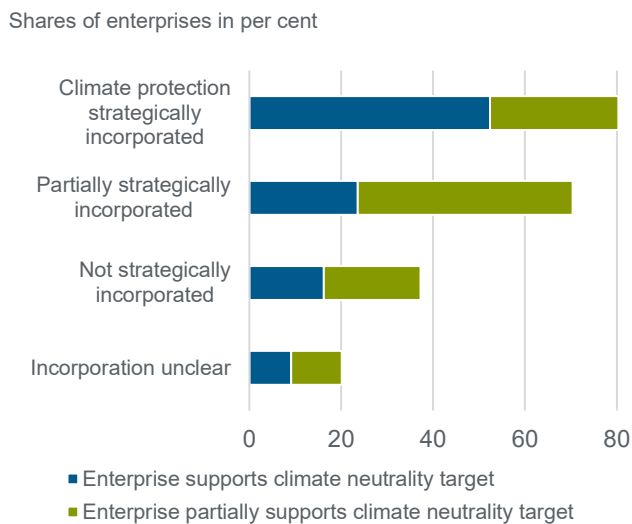
With respect to energy costs, low-energy firms in which energy makes up less than 2% of costs also see climate action as having the lowest relevance (57%). Among the more energy-intensive enterprises, on the other hand, the share is a significantly higher 70% but does not rise further with rising energy cost shares.

Most businesses support the target of climate neutrality

The current edition of the KfW Climate Barometer surveyed attitudes towards the goal of becoming climate-neutral for the first time. It revealed that a clear majority of around 60% of businesses in Germany support this goal at least in part. There is a majority in all size classes and support grows with enterprise size. While 58% of micro-enterprises support the target of climate neutrality, that figure is 67% for medium-sized enterprises and 96% for large enterprises. The sector comparison also revealed minor differences. Support is highest among manufacturing firms, at 64%, followed by services (61%) and commerce (56%). Construction firms are at the bottom of the list, with only 50% of companies at least partly supporting the target of climate neutrality.

Overall, the pattern is very similar to the one for incorporating climate action into the business strategy. Indeed, the data shows a correlation between these two characteristics (Figure 4). Enterprises that have fully incorporated climate action into their business strategy show the greatest support for the goal of climate neutrality, with 80% in favour. Support also remains well above average, at 70%, among those that have partly integrated climate action into their strategy. By contrast, only 37% of businesses that have not integrated climate action into their strategy also back the ambitious climate target. Even if this observation does not allow a causal conclusion to be drawn, it does suggest that addressing climate action as a strategic issue can be a pathway for discovering synergies for the own enterprise with the goal of climate neutrality.

Figure 4: Support for the target of climate neutrality depending on whether climate action is an integral part of the business strategy



Source: KfW Climate Barometer 2023

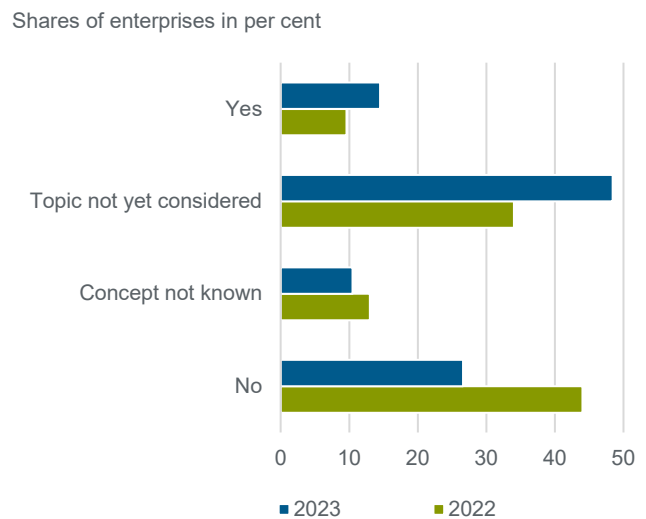
Around 15% of all businesses aspire to become climate neutral further ahead – 5 percentage points more than in the previous year

Incorporating climate action into the business strategy is an important step on the way to achieving climate neutrality in Germany by 2045. At present, only few businesses have a climate neutrality goal of their own, but that share also grew noticeably on the previous year. Around one in seven businesses (15%) now aspire to become climate neutral (Figure 5). In the previous year it was only one in ten businesses. Relatively speaking, the share of ambitious businesses grew by 50% – quite a remarkable leap.

What is interesting here is that the number of businesses that explicitly negate a climate neutrality target of their own has fallen sharply from 44% in the

previous year to now 27%. The data suggests that these firms are now more likely to admit not having studied the matter in greater detail, which points to degree of openness. Moreover, only 10% of businesses now reported that they were not even familiar with the concept – less than in the previous year (13%).

Figure 5: Climate neutrality as a goal



Note: Specifically, the question was: 'Are you aspiring for your business to become climate neutral?'

Source: KfW Climate Barometer 2022, 2023

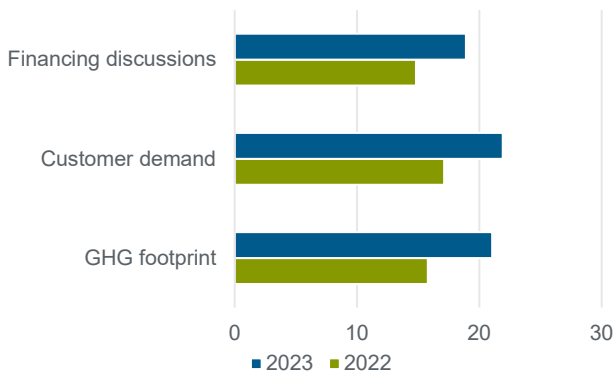
In pursuing the goal of climate neutrality, larger businesses have again taken the lead. Thirty per cent of larger SMEs and 77% of large enterprises reported aspiring to become climate neutral in the future. The usual pattern can also be seen across the various sectors. The goal of climate neutrality is most pronounced in manufacturing, where around one in five enterprises (19%) aspire to achieve it. Construction and retail both come in last, at 10% each.

Knowledge of own GHG footprint and stakeholder interest in climate action has grown

The growing relevance of businesses' impacts on the climate is becoming evident in other dimensions as well. Climate action is now more likely to be a topic of financing discussions (19 vs. 15% in the previous year) and is also being demanded more often by customers (22 vs. 17% in the previous year). Awareness of the company's own greenhouse gas footprint is growing at a similar rate. Today, 21% of enterprises can at least partly quantify their own greenhouse gas (GHG) emissions compared with only 16% in the previous year (Figure 6). At the same time, in the present survey 9% of companies reported having full knowledge of their GHG footprint, while 12% admitted having partial knowledge.

Figure 6: Stakeholder interest in climate action and knowledge of own GHG footprint

Percentages of businesses that agree or partly agree with the statement



Note: Specifically, the question was ‘To what extent do the following statements on the issue of climate action apply to your business?’ ‘Climate action is an important topic in financing discussions’, ‘Our customers demand from us a stronger contribution to climate action’ and ‘We are familiar with our greenhouse gas footprint’.

Source: KfW Climate Barometer 2022, 2023

Thus, the percentages are rising slowly but remain on a moderate level. For around one in five enterprises, climate action is now an aspect with which they are being confronted by stakeholders. This trend needs to continue in order to meet the climate targets.

What is encouraging is that 31% of all enterprises already have at least a partial plan specifically aimed at reducing their greenhouse gas emissions. These also include companies that are not familiar with their own GHG footprint or have no specific climate neutrality target yet. Conversely, however, it also means that around 70% of businesses have not yet developed any concrete plan to reduce greenhouse gas emissions,

especially small businesses and medium SMEs.

Larger enterprises are more active but SMEs are catching up

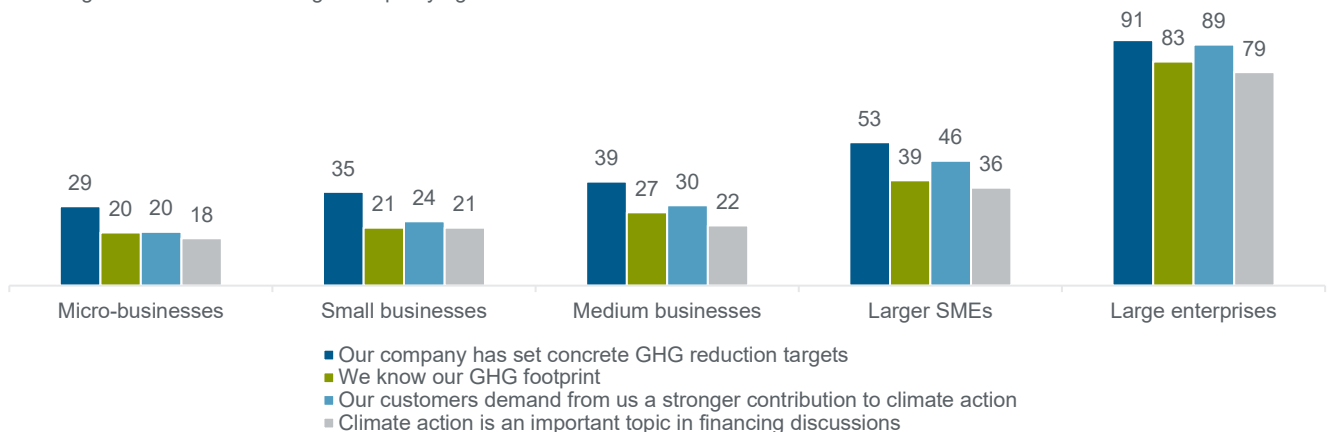
Nearly all markers for climate action relevance increase with company size. For example, 29% of all micro-businesses have at least a partial plan in place to reduce greenhouse gas emissions. This is already the case for slightly more than half of larger SMEs (53%) and more than 90% of large enterprises. Similar size differences can be seen in regard to companies’ familiarity with their own GHG footprint (from 20 to 83%, Figure 7).

Compared with the previous year, however, the momentum was different across companies of different size. SMEs were able to make progress in their own activities last year. While the share of large enterprises that were at least partly familiar with their GHG footprint was nearly unchanged, the levels for other company sizes increased considerably. Among micro- and small enterprises, the share was around 30% higher than in the previous year (from 15 to 20% and from 16 to 21%), as it was among larger SMEs (from 30% to 39%). Among medium-sized enterprises that figure even increased by 50% (from 18 to 27%). This shows that SMEs had a closer look at their own climate impacts last year.

This trend may have been driven by customer demands, for example. After all, the smallest company size classes again recorded the highest increases. The share of micro-enterprises now reporting that customers expected a contribution to climate action also increased by 30% (from 15 to 20%), while small SMEs still reported a relative increase of 20% (from 20 to 24%).

Figure 7: Greenhouse gas reduction plans and stakeholder pressure more common among larger enterprises

Percentages of businesses that agree or partly agree with the statement



Source: KfW Climate Barometer 2023

Even so, the increase among medium-sized enterprises was just under 10% (from 28 to 30%), while pressure from customers of larger SMEs and large enterprises remained unchanged. The observed increase in the role of climate action in financing discussions, on the other hand, is evident in all size classes – without showing a clear pattern in terms of company size.

A slim majority of enterprises regard their existing business model as compatible with climate neutrality

Climate neutrality means that in the future, entrepreneurial success will require greenhouse gas-neutral processes. More than half of enterprises in Germany (53%) believe that their existing business model is at least partly compatible with the target of climate neutrality (Figure 8). This is roughly the same rate as in the previous year.⁶

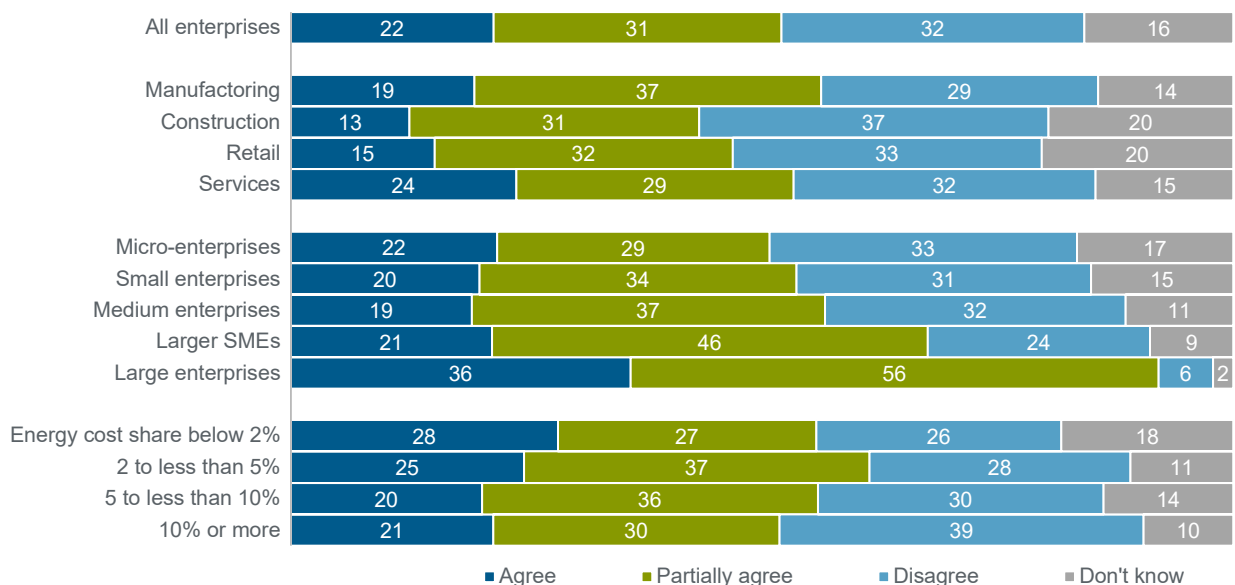
With respect to company size classes, a similar pattern can be seen as for the incorporation of climate action into the business strategy: A clear majority of large enterprises, in particular, consider it to be at least partly compatible with their business model (92%), while a clear majority of around two thirds (67%) of larger SMEs also have a favourable view with regard to their own business model. There is a slim majority among smaller enterprises, but there are also significantly more doubters. Among micro-enterprises, just barely 51% consider their business model to be at least partly compatible with the ambitious climate targets.

The differences across sectors are only minor. What is remarkable is that of all sectors, manufacturing expressed the highest level of optimism (56%) despite the major challenges they are facing. This presumably has to do with the fact that they are already dealing with the issue more comprehensively. At the other end of the spectrum is the construction sector, where fewer than half of businesses (44%) regard their business model as fit for the future in light of the climate targets. Retail is another sector in which just under fewer than half of enterprises – 47% – consider their economic activities to be compatible with the target of climate neutrality. This shows that great uncertainty still remains about possible approaches to achieving climate neutrality in these two sectors.

Furthermore, it is obvious that energy intensity exerts a moderate influence on views about compatibility with the climate targets. Thus, the highest percentage of companies reporting that their business model is fully compatible with the goal of climate neutrality, 28%, is found among those with the lowest energy cost shares (of less than 2%), while this applies to only 21% of the most energy-intensive businesses where energy accounts for 10% and more of their costs. And 39% of the most energy-intensive businesses consider their business model to be completely incompatible. This is the highest share – and significantly more than among businesses with low energy intensity (26%).

Figure 8: Compatibility of existing business model with climate neutrality

Shares of enterprises in per cent



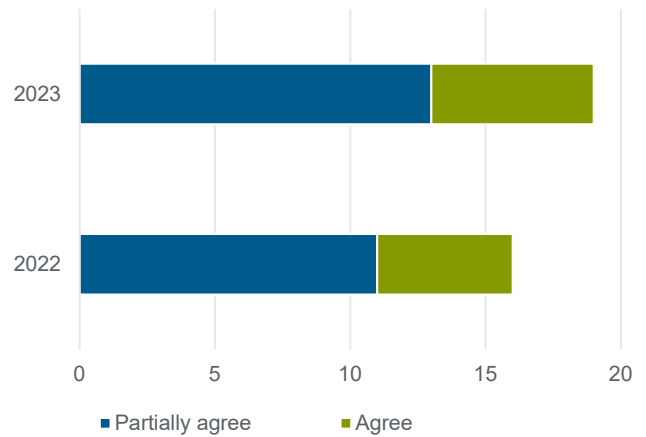
Source: KfW Climate Barometer 2023

Businesses see the transformation as providing only few opportunities for new sales markets

The transformation not only poses challenges for the respective business models but provides opportunities for tapping into new sales markets. Thus, 19% of enterprises stated that ambitious climate action at national and international level provides them with at least some opportunities for tapping into new sales markets, while that figure still stood at 16% in the previous year (Figure 9). After all, this represents a relative increase of around 20%. Here again, company size makes a difference. While around 18% of micro-enterprises see opportunities, that figure is 25% for medium-sized enterprises and even 64% for large enterprises. Nevertheless, businesses of all size classes see climate action as an issue that holds less opportunity for opening up new sales markets than strategic relevance. In other words, this suggests that it might be worthwhile to increase efforts to make businesses aware of the opportunities in order to give them positive impetus for their own strategic orientation. Already 151 states have committed to the goal of greenhouse gas neutrality. Referred to as ‘net zero’ states, they now represent 92% of global economic output and 88% of global greenhouse gas emissions.⁷ This means one thing above all: green growth markets and, hence, opportunities for future growth and employment in Germany.

Figure 9: Climate action as opportunity for new sales markets

Shares of enterprises in per cent



Note: The specific question was: ‘To what extent does the following statement on the issue of climate action apply to your business: Ambitious climate action opens up new opportunities for our business’.

Source: KfW Climate Barometer 2022, 2023

Box 2: Businesses' energy cost shares

Although many businesses were hit hard and unprepared by the steep energy price increases last year,⁸ the current data from the KfW Climate Barometer shows that the relative burden from energy costs in 2022 – measured by the share of energy costs in businesses' total costs – remained largely steady on the level of 2021.

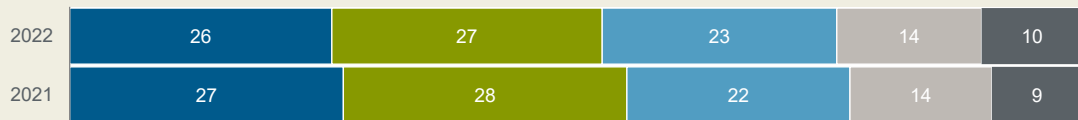
Thus, energy costs made up less than 5% of total costs in 55% of enterprises in 2021. In 2022 that share was nearly unchanged at 53%. Over the same period, the share of enterprises that had a high relative energy cost burden of at least 10% rose only slightly from 23 to 24%. Across all businesses, energy costs thus continued to play a rather subordinate role compared with other costs. One important reason that the relative energy cost burden remained largely steady compared with the previous year was that most businesses had made an effort to reduce their energy consumption (Figure 10).

However, a look at the various segments also shows that in part, energy cost burdens developed differently. Manufacturing, the segment that includes enterprises with energy-intensive production such as chemicals and the manufacture and processing of paper and metals, stands out from the remaining segments. It experienced a stronger increase in the relative burden of energy costs than all other segments.

Figure 10: Shares of energy costs in total costs

In per cent

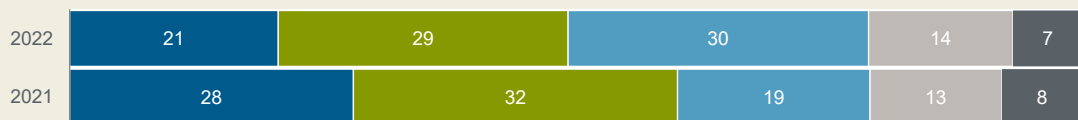
All enterprises



Manufacturing



Construction



Retail



Services



■ Less than 2% ■ 2 to less than 5% ■ 5 to less than 10% ■ 10 to less than 20% ■ 20% or more

Note: The specific question was: 'How high was the share of energy costs in total costs incurred by your business?'

Source: KfW Climate Barometer 2022, 2023

Businesses adopted a wide range of measures in response to increased energy prices

How did enterprises respond to the massive price increases last year? They adopted a wide range of measures to offset them (Figure 11).

Measures aimed at reducing energy consumption through behavioural changes were particularly popular. Nearly two thirds of all enterprises (59%) reduced their consumption by changing their behaviour to conserve energy. Examples included simple methods with directly visible and measurable success, such as lowering room temperature or reducing lighting. What is striking is that energy-saving behaviour was adopted by at least half the enterprises in all segments observed. The intense public debate about the need to reduce natural gas consumption in order to avert a supply crisis likely played a major role here.

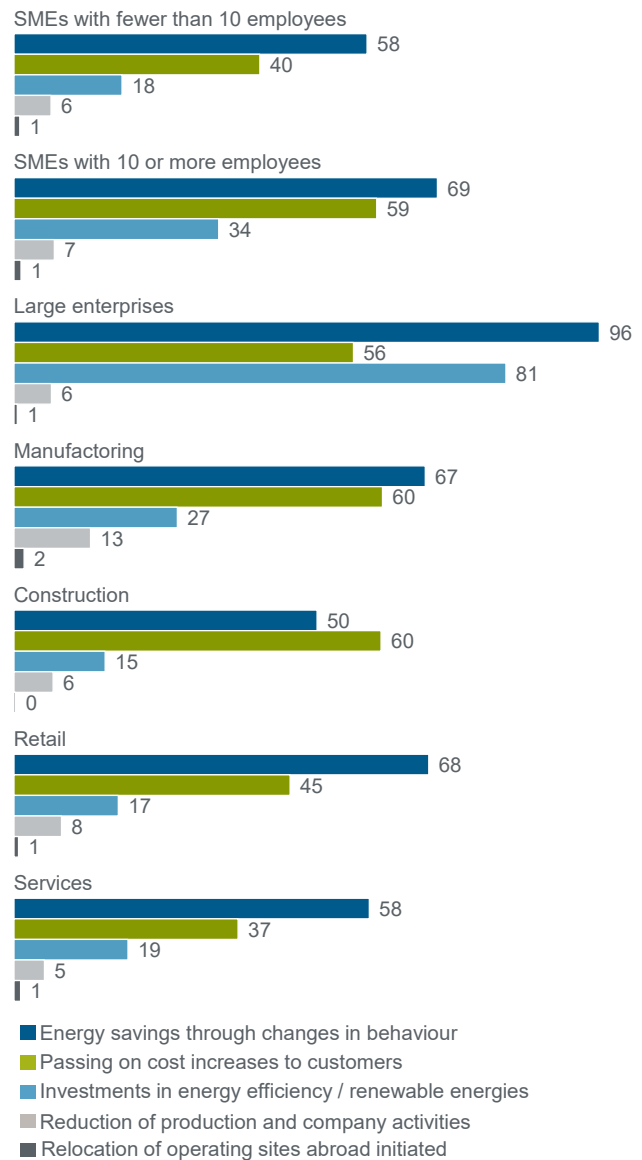
Furthermore, nearly one fifth (19%) of businesses invested more extensively in renewables and energy efficiency. These measures were very much dependent on company size. The larger the business, the more it invested. In a sectoral comparison, energy-related investment is more common among enterprises of the manufacturing sector, which is where most of the larger enterprises are situated. Besides, production and working processes in the manufacturing sector are significantly more energy-intensive than in other sectors, which gives companies greater incentives to make energy-saving investments.

More than two fifths (42%) of enterprises also passed the higher energy costs on to their customers.⁹ Small businesses and retailers, wholesalers and service providers appear to have had less scope to pass costs on to customers. The competitive situation, customer acceptance and persistent household spending hesitancy likely restricted their possibilities. As a consequence, the profit margins of these segments also came under greater pressure last year even though they were able to pass part of cost increases on.¹⁰

Businesses were less likely to cut back production and business activities (6%). There were hardly any differences between the individual segments. Only among manufacturing enterprises – which include energy-intensive industrial firms – did a relatively high rate of 13% report having reduced their production capacity. Furthermore, the increased energy prices have not yet led to an offshoring wave. A mere 1% of all businesses reported having initiated a relocation of production facilities to other countries. In the manufacturing sector it was around 2% of enterprises.

Figure 11: Measures adopted by businesses in response to increased energy prices

Shares of enterprises in per cent, multiple responses were possible



Source: KfW Climate Barometer 2023

Interest rate rises and price increases also impacted on businesses' climate investments in 2022

Businesses were afflicted not just by rising energy prices. They also lost export markets as a result of Russia's war of aggression on Ukraine and a further exacerbation of supply bottlenecks for particular commodities and inputs that had already emerged during the COVID-19 pandemic. In order to combat the associated price rises, the ECB initiated the interest rate turnaround in July of last year. Borrowing costs successively increased along with benchmark and capital market interest rates. These conditions can have two opposing effects on the appetite of German enterprises to invest in climate action.

On the one hand, high energy prices may encourage investments in the expansion of renewable energy or energy efficiency, as has previously been observed. Furthermore, the prospect of rising interest rates and concerns over further increasing inflation likely had a positive effect on investments at first, especially in the first half of 2022. During that time, when interest rates were generally still on a low level and producer prices for capital goods still rose at a moderate pace, businesses might have experienced greater incentives to avoid putting off foreseeably necessary climate investments before interest rates and capital goods prices increased even further in the second half of the year. This is also supported by the fact that lending for general investments by SMEs reached a record level in 2022, while general investment activity grew strongly at the same time.¹¹

On the other hand, some of the events of last year are also likely to have hampered climate investments. The prices of energy, commodities and inputs, which at times were very volatile and increased sharply, posed a risk for businesses that was difficult to gauge: Thus, growing uncertainty about the economic fallout of the energy crisis in combination with emerging consumer restraint may have led businesses to put off, scale back or cancel planned investments entirely. Funds that may

have been freed up by then could alternatively have been directed more strongly to investment projects that appeared more urgent in the short term, such as those that were necessary to stay in business, and no longer to clearly climate-related measures.

Particularly from the second half of 2022 onward, the increased borrowing costs are then likely to have further intensified these effects.

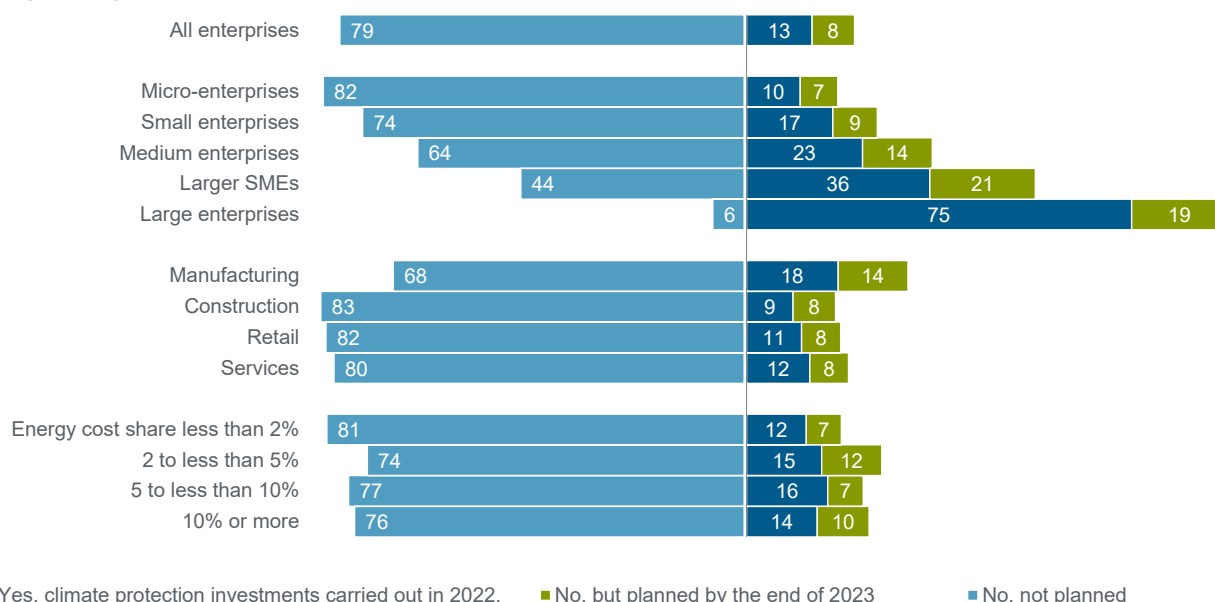
One in seven enterprises made climate-positive investments in 2022

The KfW Climate Barometer provides insights into the extent to which enterprises made climate-positive investments in Germany last year and whether the conditions last year were more conducive to or rather hampered such investments.

In 2022, one in seven of the nearly 3.8 million enterprises in Germany made domestic climate investments (Figure 12). In other words, 13% of all businesses implemented such projects. That was around 490,000 enterprises. Climate-positive investments are defined as investments in measures aimed at avoiding or mitigating greenhouse gas emissions from the relevant business in which action

Figure 12: Climate-positive investments undertaken by businesses in Germany

Shares of enterprises in per cent



Note: The specific question was 'Did your company carry out climate-positive investments in Germany in 2022?' It was also made clear that climate-positive investments mean investments in measures aimed at preventing or reducing greenhouse gas emissions which include, among others, investments aimed at conserving energy or increasing energy efficiency, measures that involve the use of renewable energy, or investments in climate-friendly mobility such as the acquisition of electric vehicles, for example. It was also noted that the climate action aspect of the investment decision did not have to be the top priority. This takes into account the fact that businesses often only consider climate action aspects in greater detail when they have to make replacement investments.

Source: KfW Climate Barometer 2023

on climate protection does not necessarily have to be the top priority. Another 8% or approx. 305,000 enterprises made no such investments in 2022 but still plan to do so by the end of the current year 2023. That means one in five enterprises currently have climate-positive investments on their agenda. At the same time, however, these figures also illustrate that the majority of German enterprises did not complete any climate-related investments in the year under review.

In terms of investor propensity by segment, large enterprises stand out above all others. The majority of large SMEs with 50 or more employees and large enterprises invested in climate-positive measures in 2022 or still plan to do so by the end of 2023. What is the reason for this? For one thing, large enterprises generally have more capacity in the form of human and financial resources to more strongly address the issue of climate action and invest accordingly. In addition, large enterprises in particular can be seen to have incorporated climate action more deeply into their corporate strategy, for example by formulating specific greenhouse gas reduction targets, which is also reflected in their investment activities. For another, larger enterprises stepped up their investments in the areas of energy efficiency and renewables in response to the increased energy prices, so that they usually contribute to climate action at the same time. And not least, increasing demand from stakeholders such as legislators, customers, financing partners or the general public to act on climate action and sustainability are likely to play an important role in leading larger enterprises in particular to make greater commitments.

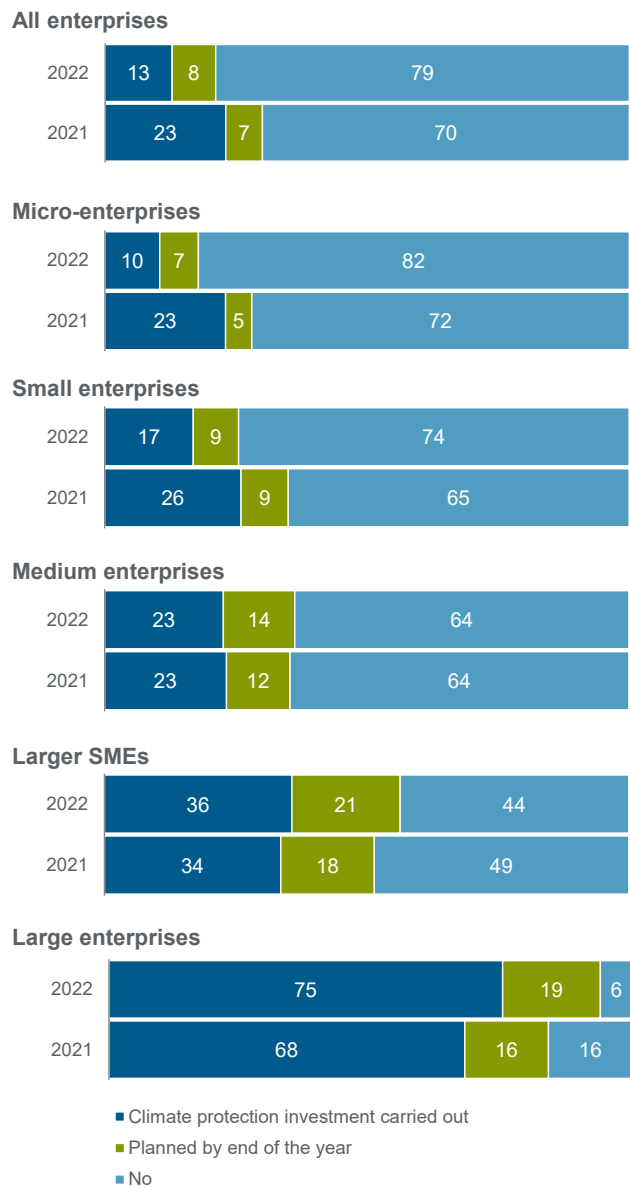
The share of manufacturing firms that have completed (18%) or are planning climate investments (14%) is also significantly higher than in other sectors. In this segment in particular, improving energy efficiency and moving from fossil fuels to alternative energy sources is likely to play an important strategic role for competitiveness – not just today, in the wake of increased energy prices, but also in the future. Furthermore, a disproportionately high share of manufacturers tend to be classified as belonging to the larger size classes.

Fewer smaller businesses invested than in the previous year, ...

However, a comparison with the previous year’s figures also shows that the share of enterprises that invested in climate-positive measures has decreased overall. The share of enterprises that completed such investments fell by 10 percentage points from 23% in 2021 to 13% in 2022 (Figure 13).

Figure 13: Share of enterprises with climate-positive investments

Shares of enterprises in per cent



Source: KfW Climate Barometer 2022, 2023

The main cause for this decline was a sharp drop in the number of investors among micro-enterprises and small firms, which dominate aggregate business trends because of their large number. Whereas around one fourth of enterprises (23 and 26%, respectively) still carried out climate-positive investments in 2021, those shares fell to 10 and 17% in the past year. At the same time, larger SMEs and large enterprises slightly expanded their investment activities again in comparison with the year 2021, starting from a higher level. Whereas 34 and 68% of those enterprises still invested in climate-positive measures in 2021, that figure already rose to 36 and 75% in 2022.

The discrepancy in the way the investor shares involved across the business size classes is likely due at least in part to the economic events that occurred in the context of the energy price crisis. For one thing, our findings illustrate that smaller enterprises are less likely than large ones to respond to increased energy prices by investing, which may also be reflected in a relatively steeper drop in their investment participation. For another, smaller enterprises experienced a comparatively sharp decline in profitability in the course of the past year.¹² It is therefore conceivable that uncertainty about the economic impact of the energy crisis predominated particularly among the (smaller) enterprises affected by profitability losses and that their willingness to invest in climate action dropped as a result. The funds they still had at their disposal were then diverted more strongly to investment projects that promised to improve their profitability more quickly in the short term, or that were more urgent for them to stay in business, and less to those with a clear climate action relevance. This argument is supported by the fact that the general investment appetite of micro-businesses grew significantly last year, unlike investments with specific climate relevance, be it as a result of catch-up effects from the COVID-19 crisis, pull-forward effects in the face of foreseeable increases in the cost of debt, etc.¹³

In addition, smaller enterprises tend to initiate a smaller number of climate-related projects than larger SMEs and large enterprises, where climate investments are more often spread out across multiple projects. Thus, deferring or abandoning just one investment project

may often mean that they cease to make any climate-related investment at all. Furthermore, the larger the enterprise, the more likely it is to have longer-term, rather fixed investment plans that are less likely to be revised.

... but still, all business segments have clearly increased the average volumes invested

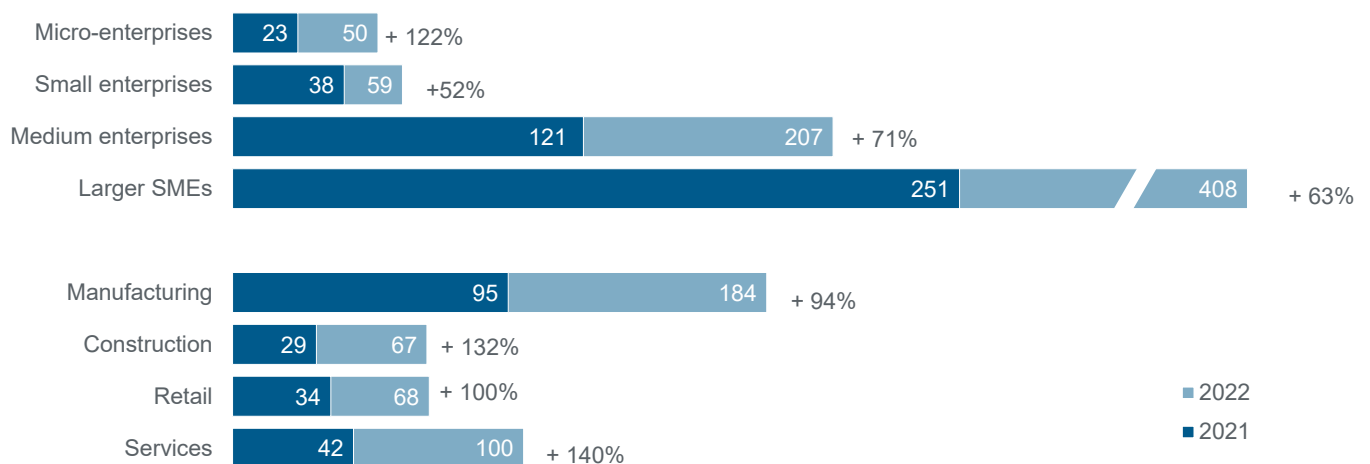
Even if the share of smaller enterprises making climate investments fell on the previous year, those that have carried out at least one climate-related investment have significantly increased the amounts invested (Figure 14).

Last year, average project sizes – which were analysed only for SMEs for reasons of methodological reliability – increased sharply in all segments under review. In a size comparison, micro-businesses recorded the strongest increase. They expanded their average investment amount by a nominal 122% to EUR 50,000 (2021: EUR 23,000) and were thus able to significantly catch up with the other size classes.

Even when accounting for the extraordinarily rate of high price increases between the years 2021 and 2022 (+10.9% annual average for gross fixed capital formation), the remaining investment volume was still +101% higher in real terms. Hence only a small portion of the increase in the volume of climate investment was driven by inflation.

Figure 14: Comparison of average volumes invested in climate-positive projects by SMEs

Average per enterprise in EUR thousands; only businesses that implemented investments with a climate focus.



Source: KfW Climate Barometer 2022, 2023

For small businesses, the amounts increased by 52% (37% in real terms) to EUR 59,000 on average. Medium and large SMEs also recorded strong increases of 71% (54% in real terms) and 63% (47% in real terms).

The development in 2022 was not driven or distorted solely by few, very large projects. Further analyses revealed that the median investment volumes also rose significantly in all segments. Thus, half the investment projects carried out by SMEs in 2022 had a volume of less than EUR 30,000. In 2021 the median was only around EUR 19,000. Thus, the energy crisis appears to have given a strong investment impetus particularly for businesses that still had sufficient capacity for climate-related investments.

Irrespective of growing average project sizes, relatively small projects continued to dominate investment activity in climate action in 2022 as well. Across all segments, the average volume invested by an SME in a climate -positive project was EUR 106,000 (compared with an average project size of EUR 179,000 in investment projects of a general nature).¹⁴ The amounts which businesses allocate to climate action investments on average grow significantly with the size of the enterprise (Figure 14). In a sector comparison, manufacturing enterprises stand out as their average investment volumes are significantly higher than in all other sectors.

In 2022, German enterprises invested a total of EUR 72 billion in domestic climate action – 18% more in real terms

Overall, total domestic climate investment by German enterprises increased by a nominal EUR 17.1 billion last year, or +31% (+18% in real terms) on the previous year, reaching a volume of EUR 72.2 billion (2021: EUR 55.1 billion). A comparison with overall gross fixed asset formation of EUR 479 billion in the corporate sector also shows that around one in seven euros (15.1%) was spent on climate investments in 2022.¹⁵ In 2021, only around one in eight euros or 12.7% was spent. Thus, not only did the volume of investment increase substantially over time but climate investments also gained in importance for enterprises compared with other areas of investment.

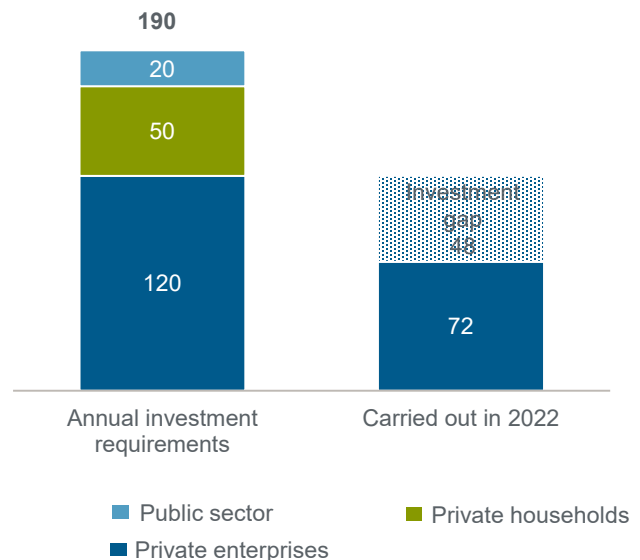
Climate action is gaining in importance as a field of investment, but investment still needs to be stepped up substantially

Nonetheless, a comparison of current investment activity with the volume of investment required in order for Germany to become climate neutral demonstrates that businesses still need to increase their annual

investments significantly. On average, the corporate sector needs to invest around EUR 120 billion each year (plus price increases over time) in order to achieve net zero by 2045 (Figure 15). That means there is currently a shortfall of at least EUR 48 billion compared with the average annual volume of investment that will be needed.¹⁶

Figure 15: Average annual investment needed for Germany to become climate neutral by 2024

In EUR billions (plus price increases over time).

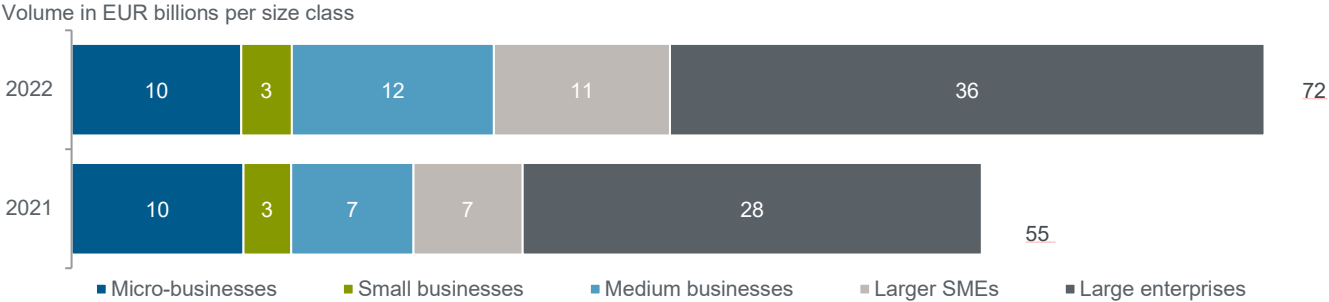


Sources: Prognos, IKT and Nextra (2021, study commissioned by KfW); KfW Climate Barometer 2023; KfW Research

Larger businesses in particular massively expanded their total climate investment in 2022

Larger businesses contributed the most to the process of making up for lost ground in necessary climate investments in the corporate sector in 2022 (Figure 16). Medium-sized enterprises with 10 to 49 employees (+65% in nominal terms from EUR 7 billion to EUR 12 billion; +49% in real terms) and large SMEs with 50 or more employees (+61% in nominal terms from EUR 7 billion to EUR 11 billion; +46% in real terms) both massively increased their climate investments on 2021. Climate investment by large enterprises also rose by a nominal 29% (from EUR 28 billion to EUR 36 billion; +17% in real terms).¹⁷ That means the three largest business segments combined accounted for more than four fifths of all climate investment. Investment by micro- and small enterprises, on the other hand, remained nearly constant at EUR 10 billion and EUR 3 billion. Given that the number of investors in the segment of small businesses dropped sharply last year, this development is nonetheless worthy of mention.

Figure 16: Climate investments by enterprise size classes



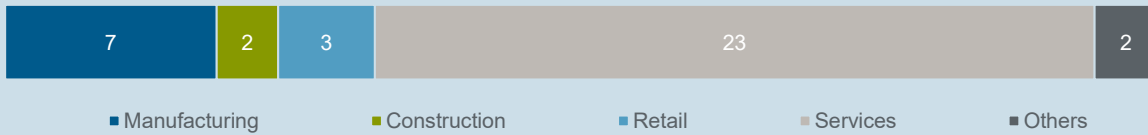
Source: KfW Climate Barometer 2022, 2023

Box 3: Climate investments by SMEs

The climate investments undertaken by SMEs can be identified by sector (Figure 17) and area of measures (Figure 18).

Figure 17: Climate investments by SMEs by sector in 2022

Volume in EUR billions per sector



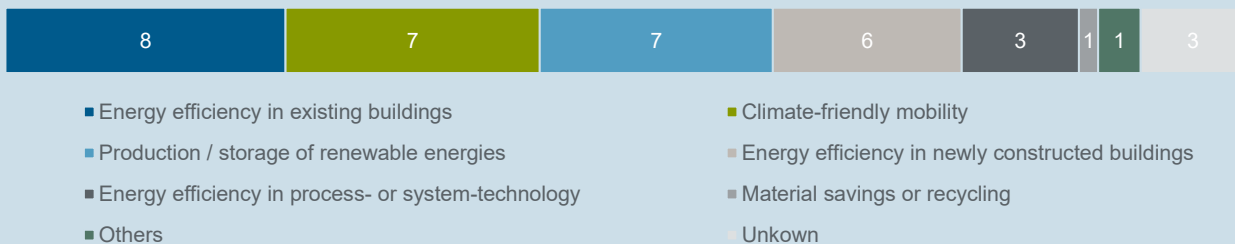
Source: KfW Climate Barometer 2023

In total, small and medium-sized enterprises invested EUR 36.2 billion in measures aimed at mitigating or avoiding greenhouse gas emissions in 2022 (2021: EUR 27.3 billion), a nominal increase of 33% on 2021 (20% in real terms). That currently puts the share of climate investment in all new investment by SMEs (EUR 240 billion¹⁸) at 15.1%. A sector comparison shows that manufacturing SMEs in particular were able to substantially expand their climate investments (+48% in nominal terms, from EUR 4.5 billion to EUR 6.7 billion). Because of their energy-intensive processes, businesses in this segment were more heavily affected by rising energy prices than SMEs in all other sectors. As a consequence, these businesses invested more in renewable energy or energy efficiency measures (Figure 11).

The lion's share of climate investments was undertaken by businesses from the services sector in 2022 as well. Climate investments there increased by 35% (from EUR 16.7 billion to EUR 22.6 billion, +22% in real terms). The fact that service providers accounted for most of the climate investments has to do with the strong structural significance of this sector. Other services (without retail) is made up of 2.4 million businesses alone, which represents a share of 64% of all businesses. It is also plausible that a large portion of climate investment is undertaken in this sector. In construction and retail, on the other hand, climate investment tended to move sideways in the year under review.

Figure 18: Volume of funds allocated by SMEs to climate investments per area of measures in 2022

Volume in EUR billions per measure



Source: KfW Climate Barometer 2023

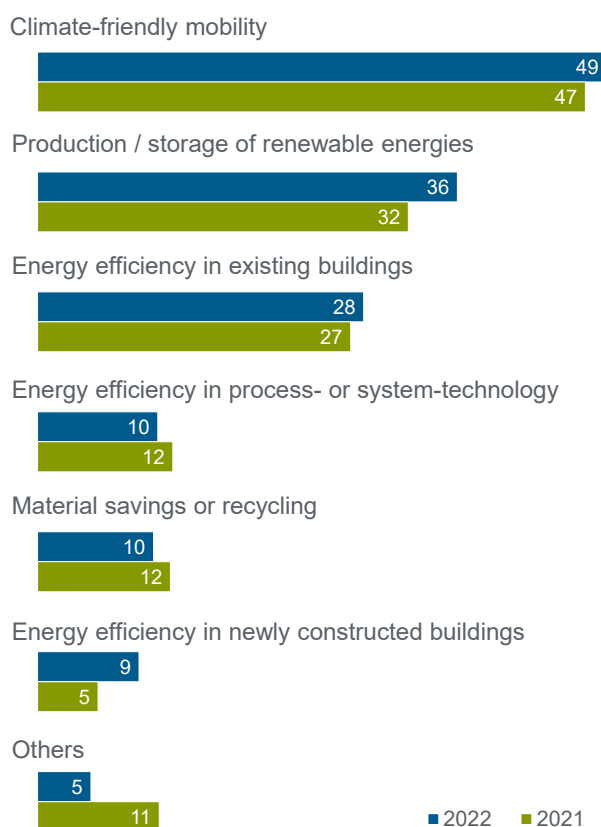
Many areas of measures reflect the expansion of SMEs' total climate-positive investments. The generation/ storage of electricity from renewables exhibited a particularly sharp increase last year, nearly doubling on the previous year from EUR 3.5 billion to EUR 6.8 billion. As a result of last year's increases in the prices of fossil fuels, it is safe to assume that renewables have become increasingly more attractive for many businesses. After all, they help them become more independent from fossil fuels. Accordingly, businesses might have experienced greater incentives for investing large sums of money in renewables, which in turn likely explains the sharp increase in this area of measures. Investments in climate-friendly mobility also increased at a relatively high rate from EUR 5.1 billion to EUR 7.4 billion (+45% in nominal terms). In terms of sums invested, the building sector dominated again, as it did in 2021. Investments in the energy efficiency of existing and newly erected buildings amounted to EUR 13.7 billion in 2022, representing 40% of the total volume. A sharp increase on the previous year was recorded in energy efficiency investments in newly erected buildings (from EUR 3.2 billion in 2021 to EUR 5.5 billion in 2022, +73% in nominal terms.)

Continuity in the measures adopted: half of all businesses invested in climate-friendly mobility, a good one third in renewable energy

The order of priority of climate-positive measures implemented remained unchanged in 2022. Businesses that made climate-related investments did so primarily by taking action in the field of climate-friendly mobility (Figure 19). Almost half of those making investments (49%) carried out such projects, for example by acquiring an electric vehicle or charging infrastructure. The high share of investments in mobility is probably due to the fact that (almost) all businesses have at least one company car, many of which are electric. Thus, one in four businesses already had at least one electric car in its company fleet in 2021.¹⁹

Figure 19: Purposes of climate-positive investments

Percentages of investors, multiple responses were possible



Source: KfW Climate Barometer 2022, 2023

A good one third of investing enterprises (36%) implemented measures for generating or storing electricity or heat from renewable energy sources. That was four percentage points more than in 2021. The third most frequent measures continued to be investments aimed at making existing buildings more energy-efficient (for example by installing thermal insulation or heat pumps), with 28% of investors active in this area. Measures aimed at improving energy efficiency in process or systems engineering (for example in production and cooling), conserving or recycling materials followed at some distance, with 10% of businesses investing in each of those areas. Around 9% of investing businesses carried out energy efficiency measures in newly erected buildings. This area of measures also gained in importance disproportionately on the previous year (+4 percentage points).

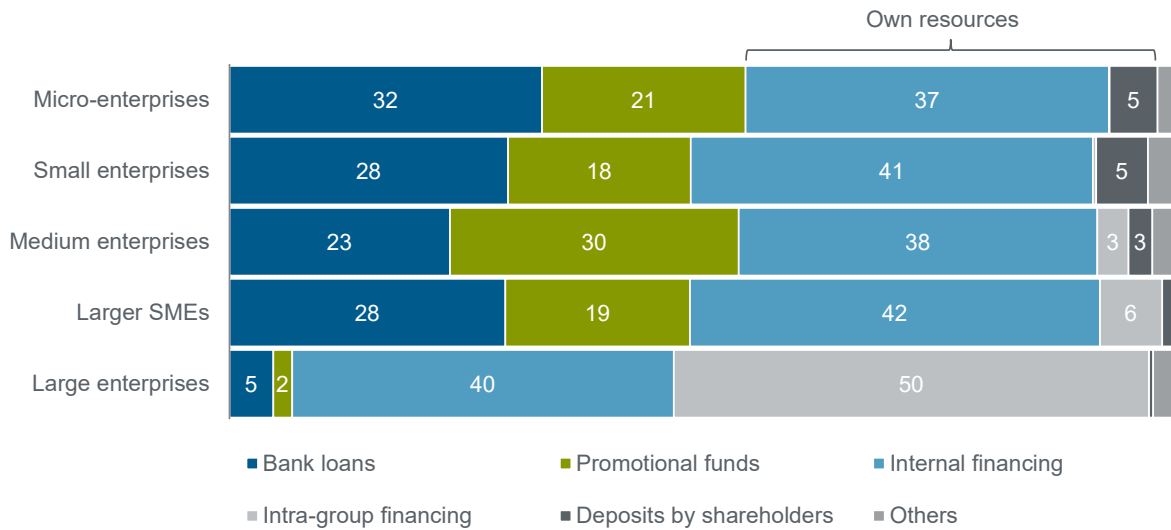
Businesses funded most climate action investments from their own resources

Most of the climate investments made by businesses were funded from own resources (between 42% in the segment of micro-enterprises to 91% in large enterprises). These included internal funding, intra-group funding and, to a lesser extent, shareholder contributions (Figure 20). The volume of funding from internal resources amounted to around EUR 49 billion across all size classes overall in 2022. Purely internal funding – from retained earnings, depreciations and reserves – took a nearly identical share of around 40% of the investment volumes in all company size classes.

Differences in the funding mix of climate investments between company size classes were evident primarily in intra-group funding structures. These include loans from affiliated enterprises, cash pooling or similar. This method of funding is relevant almost exclusively for large enterprises. Even so, large enterprises mobilise half of the investment volumes for climate action projects with the aid of intra-group funding. In this funding method, parent companies make funds available to their subsidiaries or vice versa (e.g. in the form of loans). This also explains the high relevance of this funding method for large enterprises. After all, larger enterprises by nature are much more likely to be organised in groups of companies. Groups of companies or group structures do not exist or are not substantially relevant for sole traders or micro-enterprises.

Figure 20: Funding of climate action investments in the year 2022

Percentages of investment volume



Note: 'Other sources' include, among others, publicly traded capital market instruments such as bonds and shares.

Source: KfW Climate Barometer 2023

For smaller enterprises, shareholder loans are more likely to play a role – even if on a much lower scale (5% of the sums invested by micro- and small businesses vs. 0.4% for large enterprises). In this model, instead of affiliated companies it is natural persons that make loans available to their company.

Credit finance is of growing importance for SMEs and they also use promotional funds more often

The total volume of loans received from banks and savings banks (including current-account loans and overdraft facilities) for climate action investments across all size classes in 2022 amounted to some EUR 12 billion. There was also a clear difference in borrowing by company size class. Whereas 23% to 32% of the investment volumes mobilised by SMEs (from micro-businesses to larger SMEs) were funded with the aid of bank loans, traditional loan financing hardly plays a role in climate investments for large enterprises (5%)

A comparison with the previous year’s figures shows that loan financing gained in importance primarily for SMEs. Whereas in 2021 the corresponding shares in total investment volume were still around 20% in the segment of micro-businesses, small enterprises and larger SMEs, that figure reached 28 to 32% in 2022. Only among medium SMEs was a decline recorded in the share of loan finance on the previous year.

The growing importance of loan finance is not specific to climate investments but can also be seen in investment finance overall. The KfW SME Panel

established that the readiness or appetite of SMEs to negotiate investment loans with banks was stronger in 2022 than it had been for a long time – also because of the generally broader investment activity of enterprises and, with it, rising funding requirements across all investment areas. The significantly increased average project sizes may also play a role in the financing of climate investments, since the cost and effort involved in taking up a bank loan volume decreases relative to investment with the size of the project, so that borrowing makes economic sense (also compared with funding from own resources). It is also safe to assume that many companies were still keen to benefit from the comparatively favourable borrowing conditions on the eve of the subsequent interest rate turnaround. Growing appetite for negotiations came with an extremely high rate of successful outcomes. The rate of loan denials fell to an all-time low in the past year. ²⁰

For the current year 2023, however, it remains to be seen what effect the interest rate turnaround – and with it, rising loan interest rates – will have on the credit financing of climate action investments. The market for corporate loans is currently rather characterised by below-average appetite for negotiations, dampened credit demand and more difficult access to credit. Access to credit finance has become much more difficult, with high interest rates making things particularly hard for businesses. This is likely to have a dampening effect on investment activity, if slightly less on climate investments than on other investments, as credit finance plays a slightly lesser role for the former (see also Box 4).

Promotional loans amounted to some EUR 9 billion. If we look at company sizes, what is striking is that this method of financing plays an important role for SMEs in particular, where it ranges from around 18 to 30%. For large enterprises, this share is a mere 2%. Besides the generally more limited offer of promotional loans for large enterprises, this is also likely due in part to the fact that public promotional funds are usually capped. They automatically play a less important role for enterprises that have relatively high funding requirements.

Around EUR 3 billion came from other sources. This funding category likely includes, in the main, publicly traded capital market instruments, such as bonds and shares, but also over-the-counter equity.

Two in five enterprises have medium-term plans to expand their climate investments

The findings of the KfW Climate Barometer show that climate-positive investments will continue to gain in importance in the medium term (Figure 22). Thus, a total of 29% of businesses plan to moderately increase their climate investments in the next three years. In the previous period that share was only 25%. Around 8% of businesses – the same proportion as in the previous year – even expect a significant increase. Not just those that completed climate action investments in the previous year (61%) are planning an increase. Even among those businesses that had not (yet) carried out any climate action investments in 2022, roughly one third (33%) expect an expansion.

The longer-term outlook also paints the typical picture. The larger the enterprise, the more ambitious are its investment plans. Thus, almost all large SMEs (73%) and large enterprises (93%) plan to expand their climate action investments in the medium term. Furthermore, 44% of businesses in the manufacturing sector plan to expand their climate action investments, more than in the other sectors.

Box 4: Few differences to traditional investment finance in the SME sector

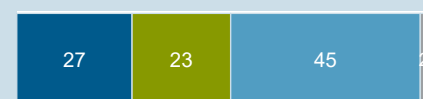
It is possible to explore how SMEs use the various methods of funding compared with traditional investment finance (Figure 21). In particular, they seek bank loans less often and use more promotional finance to fund climate action investments. The relatively high share of promotional funds used likely reflects the diverse offer of public promotional programmes for climate projects. In financing climate action projects, enterprises are already more reliant on promotional funds for the sole reason that climate action investments often have a less favourable risk-return profile than more climate-damaging investment alternatives. A key reason for this is that the external costs of environmental damage resulting from more climate-damaging alternatives are not fully internalised.

In loan financing, another factor is that because of the lower average investment sums raised for climate action projects (EUR 106,000 on average) compared with general investment projects (EUR 179,000 on average) the cost and effort incurred by a business in applying for a loan and the costs incurred by a bank in processing it in relation to the financing volumes are more likely to speak against loan financing. Besides, external financiers often demand risk premiums on loans to finance investments in novel climate-positive technologies, another argument against financing with bank loans.

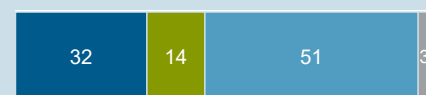
Figure 21: Comparison of funding mix in climate investments vs. overall investments by SMEs

Percentages of investment volume, 2022

Climate protection investments



Total investments

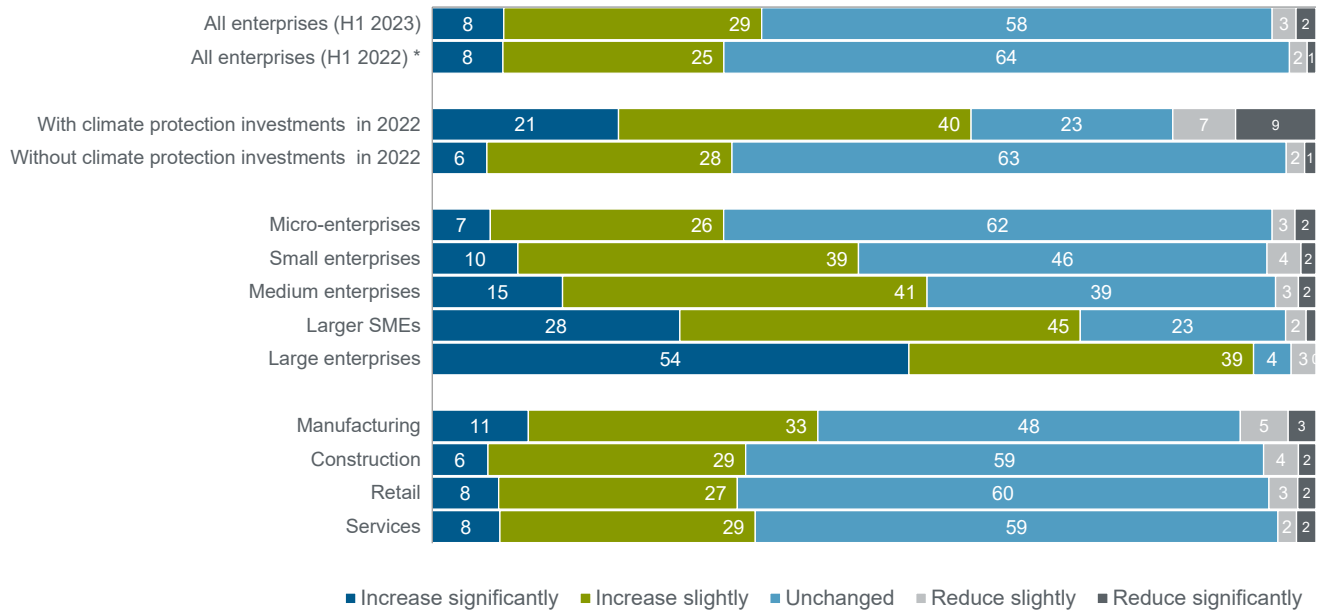


■ Bank loans ■ Promotional funds ■ Own resources ■ Others

Sources: KfW Climate Barometer 2023, KfW SME Panel 2023

Figure 22: Expected development of climate investments in the next three years

Shares of enterprises in per cent



Note: * In the survey year 2022 (1st wave of the KfW Climate Barometer), a slightly longer period – the next three to five years – was used to analyse the expected development.

Source: KfW Climate Barometer 2022, 2023

Enterprises see various barriers to implementing climate action investments

Even if progress in climate action efforts is identifiable in many areas, the findings of the KfW Climate Barometer also revealed that businesses face a number of different barriers to planning and implementing climate action investments (Figure 23). Topping the list are cost-effectiveness and financing aspects. However, internal and external conditions such as the availability of materials, the existence of human resources or adequate information about greenhouse gas mitigation options are also important criteria for businesses.²¹ More than one third of businesses (37%) also reported again that they regarded other topics as more important or that climate action played only a secondary role.

The greatest challenges: insufficient cost-effectiveness and financial resources

The most pressing barriers to investment can be traced back to economic and financial aspects. More than one quarter (26%) of all businesses reported uncertainty over the cost-effectiveness of their investment as a very relevant barrier to the implementation of climate investments. A further 24% consider it a rather relevant barrier. In total, that represents half of all businesses – and thus a slight increase on the previous year. Just under half (45%) of businesses see a lack of financial resources as a relevant barrier (22% very relevant, 23% rather relevant). This rate also grew on the

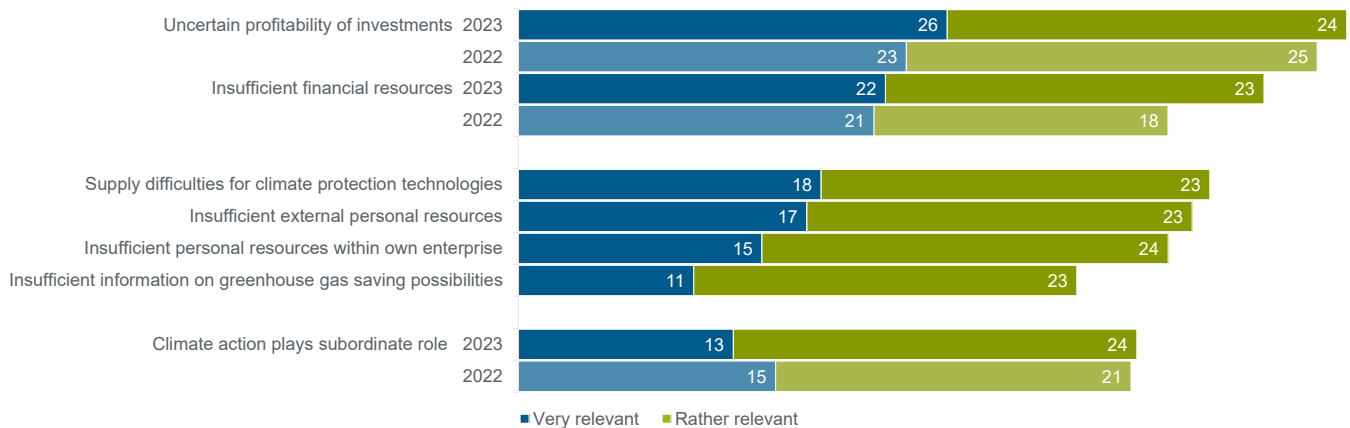
previous year and actually increased at a slightly more pronounced rate of +6 percentage points.

The fact that the costing of climate action investments often turns out less favourable than non-green investment alternatives is also partly due to the fact that the environment is a ‘public good’, that there is no basis for preventing its use. Thus, the costs caused by greenhouse gas emissions are not borne by those who caused the damage but by society (which means a negative external effect). Accordingly, the emitters of greenhouse gas emissions do not sufficiently calculate the costs of the negative impact of their actions on society as a whole and, all other things remaining equal, green investments have a poorer risk-return profile than investment alternatives that damage the climate.

A reliable and rising carbon price is therefore a key lever for climate action investments to make business sense in the long term. Businesses recognise that planning certainty around carbon pricing is one of the most important conditions for a favourable, incentive-compatible investment environment. Thus, a majority (56%) of businesses already advocated greater planning certainty with regard to carbon pricing in last year’s survey – despite the fact that carbon pricing initially places an additional cost burden on businesses.²²

Figure 23: Barriers to climate investment

Shares of enterprises in per cent



Note: The specific question was: 'How relevant are the following barriers for the implementation of climate-positive investments in your enterprise?' The response categories were 'very relevant', 'rather relevant', 'less relevant', 'not relevant'. We report here on the share of enterprises that responded 'very relevant' or 'rather relevant'. Items changed compared with wave 1, so previous year's figures cannot be given for all items.

Source: KfW Climate Barometer 2022, 2023

Furthermore, information asymmetries between businesses and potential capital providers may play a further important role, particularly in the financing of climate investments. The opportunities and risks of novel climate technologies in particular are often hard for capital providers to assess. As a consequence, providers of external capital are less willing to fund such projects or charge higher interest to make funds available. Besides, high upfront investments for climate technologies may overwhelm businesses' financial capacity. Adequate financial support is therefore also required in order to mitigate financial barriers to investment. Promotional instruments such as grants, interest rate reductions and exemption from liability may be suitable instruments to achieve this.²³

Supply problems also pose a risk for climate action investments

Since the beginning of the COVID-19 pandemic, problems in the supply of raw materials and inputs have become a more prominent factor that was even exacerbated with the outbreak of Russia's war of aggression. Many businesses now perceive supply bottlenecks as a risk to Germany's competitiveness.²⁴ Already two in five enterprises (42%) point to supply difficulties (for example for heat pumps and photovoltaic systems) as a barrier to the realisation of climate investments (Figure 23).

Given the growing need for green technologies around the globe, the availability of relevant raw materials and components for climate technologies can be expected to gain in importance into the future. The German government has already provided important impetus for

resource security with its Raw Materials Strategy. However, businesses can also contribute to greater raw materials security by actively increasing their own resource efficiency, making use of the recycling industry and diversifying their procurement sources.²⁵

Skills shortages are also hampering enterprises' climate investments

The shortage of skilled workers is now a widespread and growing problem in Germany.²⁶ While the share of businesses that saw skills shortages as an impediment was around 10% in 2009, that figure has since quadrupled. At the start of the second quarter of 2023, 42% of businesses in Germany reported that skills shortages were affecting their operations.²⁷ A major reason for this is the successive departure of post-war baby boomers from the workforce.

In the face of these developments, it is hardly surprising that many businesses see skills shortages as an impediment to the green transformation. Thus, around 40% of businesses regard the lack of in-house human resources as a relevant barrier to the implementation of climate projects (Figure 23). Compounding the general shortage of skilled labour, decarbonisation activities in many cases also require specific skills that are distinct from the other skills businesses need.²⁸ In-demand qualifications range from regulatory and commercial skills that are of relevance to the strategic implementation of climate action plans to specific digital and technical skills needed for the installation of technologies.

The success of many climate action projects, however, depends not only on the qualifications of internal

employees but often on the availability of external expertise as well. Craftspeople who are involved in the installation of energy systems, with their various advisory, assembly and maintenance activities, are a good example of this.²⁹ In this context as well, 40% of businesses mentioned a lack of external skills as a relevant impediment to the realisation of climate investments (Figure 23).

The figures highlight that there is an urgent need to address both the availability and the qualification of skilled workers. Easing the general shortage of skilled labour requires measures such as increasing the intake of skilled migrants or bringing more women and older workers into the workforce. Furthermore, training and ongoing education offerings must be tailored to companies' changed skills requirements so that skills shortages do not become a bottleneck in the green transformation in the future. In this context, targeted skills development strategies such as the current support initiatives of the German Federal Government for strengthening further training measures for tradespeople can point in the right direction.

SMEs in particular do not have enough information on how to reduce carbon emissions

Having adequate knowledge of the areas in which climate action projects can be meaningfully tackled is an important precondition for businesses to approach them in a targeted manner in the first place. In this respect, however, the data of the KfW Climate Barometer shows that lack of information about ways in which they can reduce their greenhouse gas emissions are a relevant obstacle to climate investments for just over one third of enterprises (34%). Information deficits are most pronounced among small and medium SMEs. Whereas only 24% of large enterprises stated that lack of information about possible ways to cut emissions are a relevant barrier for them, that figure is 34% among SMEs. The difference between the size classes must be seen against the background that sustainability reporting obligations and due diligence requirements have already forced large enterprises to deal with the greenhouse gas emissions and reduction potentials of their operations more intensively in the past.

What are referred to as transformation advice services can be helpful in reducing information deficits among smaller businesses and medium SMEs. This involves identifying approaches for green business practices in individual enterprises with the aid of external advisers. The insights gained in this way enable businesses to carry out climate action investments in a more targeted manner and focus their greenhouse gas reductions on areas in which they can achieve the greatest effect.

Conclusion

Despite the economic uncertainties caused by the energy crisis, businesses in Germany increased the volume of domestic climate investment from EUR 55.1 billion in 2021 to EUR 72.2 billion in 2022. In real terms, that is, adjusted for inflation-driven price increases, this represents sizeable growth of 18%. An important factor for this development was the strong increase in fossil fuel prices, which made investments in energy efficiency and the use of renewables more attractive. Pull-forward effects resulting from the foreseeable increases in the cost of debt capital and rising prices for capital goods are likely to have boosted investment activity as well, particularly in the first half of 2022. Larger businesses in particular massively expanded their total climate investment in the past year.

It remains to be seen whether the positive trend in climate action investment has continued in the current year 2023. The rapid increase in borrowing costs, generally tightening financing conditions and the current phase of economic weakness could act as a dampener on investment behaviour.

The welcome growth in climate investment last year shows that climate action is already on the agenda of many businesses. But there is still a lot of work to do. In order for Germany to become climate-neutral by the middle of the century, on average around EUR 120 billion will have to be invested by the corporate sector every year. In order to permanently close this investment gap it will remain necessary to address the wide range of investment barriers with a targeted mix of instruments.

The KfW Climate Barometer 2023 clearly highlights that economic and financial constraints are the most pressing barriers to investment. A reliable and predictably rising carbon pricing signal is crucial for climate-friendly technologies to prevail in the long term over fossil alternatives that damage the climate. The lack of financial resources for implementing climate projects, which even gained in importance compared with the previous year, underscores how important it is to provide an adequate financing and support framework, including with subsidies, reduced-interest loans or risk assumption, for the deployment of novel climate technologies.

Difficulties in sourcing climate technologies, skilled labour shortages and lack of information on how to reduce greenhouse gas emissions, particularly in the SME sector, are also relevant investment barriers that require a greater focus.

The comparison with the previous year's survey demonstrates that climate action has acquired greater strategic importance for businesses. Nearly two thirds of all businesses in Germany have now at least partly enshrined climate action in their corporate strategy. That is an increase of 10 percentage points on the previous year. This development must be rated positively because addressing the topic from a strategic perspective often facilitates the implementation of climate investments. In doing so, SMEs were able to make up for some lost ground both with a view to both enshrining climate action in their corporate strategy and gaining greater awareness of their own greenhouse gas footprint compared with large enterprises, which already demonstrated significantly higher activity in these areas in the previous year. However, the finding that 70% of businesses still do not have any concrete

plan to reduce greenhouse gas emissions shows that there is still room for them to improve in putting their climate action strategy into practice. This applies to small and medium SMEs in particular.

The current edition of the KfW Climate Barometer surveyed the attitude of businesses towards Germany's goal of becoming climate-neutral for the first time. The findings are encouraging: A clear majority of around 60% of enterprises in Germany support this goal at least in part. Thus far, only few businesses have a climate neutrality goal of their own, but that share also grew noticeably on the previous year. Relatively speaking, the share of ambitious businesses increased by 50% – quite a remarkable trend. Again, larger enterprises are at the forefront, and at sectoral level, manufacturers are leading the way.

Box 5: Dataset of the KfW Climate Barometer 2023

Business investment in climate solutions is of high relevance for achieving Germany's national climate targets. The KfW Climate Barometer, a survey that was conducted for the first time in 2022 and is now available in its second wave, is the first and thus far only representative database for the investment behaviour of all German enterprises in the field of climate action on the road to climate neutrality. It comprises small and medium-sized enterprises as well as large enterprises, thereby mapping the entire business landscape. The surveys carried out under the KfW Climate Barometer form the basis for analyses on climate investments and attitudes concerning the implementation of the energy transition and climate neutrality. Accordingly, the barometer provides a representative picture of the current situation, needs and plans of the businesses.

The established survey instrument of the KfW SME Panel forms the starting point. It has been conducted since 2003 as a recurring postal survey of small and medium-sized enterprises in Germany with annual turnover of up to EUR 500 million – including micro-businesses and sole traders. With a database of up to 15,000 companies a year, the KfW SME Panel is the only representative survey of the German SME sector, making it the most important source of data on issues relevant to the SME sector (you will find more detailed information on the internet at www.kfw-mittelstandspanel.de). A total of 11,328 SMEs took part in the current wave.

In order to obtain a comprehensive picture of the investment behaviour of all enterprises in the field of climate action, the survey also includes large enterprises with an annual turnover of more than EUR 500 million. This segment, which comprises around 1,800 enterprises in Germany, is also surveyed in writing since 2022. Large enterprises and SMEs are largely asked the same questions, for example regarding their attitudes about climate neutrality and climate action, investments in climate solutions, funding of climate investments, barriers to implementation and their energy costs. Overall, 138 large enterprises participated in the survey in 2023.

The basic population surveyed for the KfW Climate Barometer thus comprises all enterprises in Germany. They include private-sector companies from all industries. Not counted are the public sector, banks (central banks and credit institutions) and non-profit organisations. The sample is designed in such a way that it can generate representative and reliable data. In order to be able to draw conclusions on the basic population based on the sample, the results of the survey were weighted or extrapolated (net sample in relation to the basic population). The results are therefore representative.³⁰ The data of the KfW Climate Barometer is also available to external researchers for use in exchange visits to KfW Research.

The 2023 survey wave was conducted by GfK GmbH on behalf of KfW Group. The survey period ran from six February 2023 to 16 June 2023.

Further information can be obtained at www.kfw.de/klimabarometer.

Supplementary information about the business sector in Germany

In 2022 there were 3.81 million businesses in Germany. Approx. 3.1 million businesses are domiciled in the western German states (82%), while 686,000 (18%) are domiciled in eastern Germany. In this report, the SME sector covers all enterprises in Germany with an annual turnover of not more than EUR 500 million. According to this definition, SMEs account for 99.95% of all enterprises in Germany. Some 1,800 businesses are defined as large enterprises with an annual turnover exceeding EUR 500 million.

The vast majority of enterprises in Germany is very small. Eighty per cent of businesses have fewer than five employees. That share has also grown by around two percentage points since the turn of the millennium. A further 10% of enterprises have 5 to 9 employees. That means nine out of 10 enterprises in Germany have fewer than 10 employees. Only 2% of enterprises have more than 50 employees. The fragmented nature of the business sector is reflected in the average employee headcount. In 2022 the average number of employees was around 10.5 workers per business. In the SME sector (i.e. without large enterprises), the average number of employees including owner-managers was approx. 8.5. The greater fragmentation was primarily due to increasing tertiarisation.

Accordingly, economic activity is strongly shaped by services businesses. Around 77% of all enterprises operate in service industries, including retail and wholesale. This comprises nearly 3 million businesses. With a share of just over 5%, manufacturing has a comparatively low share in the number of businesses, but it provides employment to 16% of all workers. With around 36 employees, its average workforce is also significantly larger than in services businesses (around 10 employees) or the construction sector (approx. seven workers).

¹ Cf. BDEW (2023): Ein Jahr nach dem russischen Gaslieferstopp: Die Gasversorgung wurde erfolgreich auf ein neues Fundament gestellt (*One year after Russia's gas supply stop: gas supply successfully placed on a new foundation* – our title translation, in German), press release of 30 August 2023.

² Cf. Federal Network Agency (2023): Vorbereitung für den Ernstfall. Krisenübung zur Gasversorgung (*Preparing for an emergency. Crisis exercise on gas supply* – our title translation, in German). Press release of 21 September 2023.

³ The prices of natural gas in European markets rose steeply already in the autumn of 2021. Major reasons for this were sharp increases in global demand for natural gas driven by rising economic output after pandemic-induced downturns, but also an artificial scarcity created by Russian gas suppliers.

⁴ Cf. Brüggemann, A. and Grewenig, E. (2023): Globale Erderwärmung schreitet voran: 41 % der deutschen Unternehmen aktuell oder perspektivisch vom Klimawandel betroffen (Global warming is increasing: 41% of German companies affected by climate change now or in the future – in German), Focus on Economics No. 430, KfW Research.

⁵ Cf. Brand, S., Römer, D. and Schwartz, M. (2021): Investing EUR 5 trillion to reach climate neutrality – a surmountable challenge, Focus on Economics No. 350, KfW Research.

⁶ At 53%, the percentage is slightly lower than in the previous year (55%). However, the specific question was slightly reformulated so that a comparison over the years is of limited informative value.

⁷ Cf. Net Zero Tracker (2023): Data Explorer, [Net Zero Tracker | Welcome](#), retrieved on 29 September 2023.

⁸ Cf. Schwartz, M., Abel-Koch, J. and Brüggemann, A. (2022), Hohe Energiekosten durch den Krieg in der Ukraine – in der Breite des Mittelstands (noch) tragbar (High energy costs as a result of the war in Ukraine – (still) bearable for most SMEs – in German), Focus on Economics No. 403, KfW Research.

⁹ With respect to the general cost increases of the year 2022 – i.e. beyond pure energy cost increases – around 63% of all small and medium-sized enterprises recently reported under the KfW SME Panel 2023 having passed the increased costs of materials, energy and wages on to customers since the outbreak of the war in 2022 by raising the prices of products and services accordingly. See Schwartz, M., and Gerstenberger, J., (2023), KfW SME Panel 2023: SMEs' resilience is being put to the test. So far, they have come away with few bruises, but now they are increasingly nervous, KfW Research

¹⁰ Cf. Schwartz, M., and Gerstenberger, J., (2023), KfW SME Panel 2023: SMEs' resilience is being put to the test. So far, they have come away with few bruises, but now they are increasingly nervous, KfW Research

¹¹ See development of overall investment activity by SMEs: Schwartz, M., and Gerstenberger, J., (2023), KfW SME Panel 2023: SMEs' resilience is being put to the test. So far, they have come away with few bruises, but now they are increasingly nervous, KfW Research

¹² Cf. Schwartz, M., and Gerstenberger, J., (2023), KfW SME Panel 2023: SMEs' resilience is being put to the test. So far, they have come away with few bruises, but now they are increasingly nervous, KfW Research.

¹³ Cf. Schwartz, M., and Gerstenberger, J., (2023), KfW SME Panel 2023: SMEs' resilience is being put to the test. So far, they have come away with few bruises, but now they are increasingly nervous, KfW Research.

¹⁴ Cf. Schwartz, M., and Gerstenberger, J., (2023), KfW SME Panel 2023: SMEs' resilience is being put to the test. So far, they have come away with few bruises, but now they are increasingly nervous, KfW Research.

¹⁵ Gross fixed capital formation in the business sector comprises private sector investment in machinery and equipment plus construction (without residential construction). Total business investment is calculated by KfW Research on the basis of data from the Federal Statistical Office by adjusting gross fixed capital formation for investment by the state and in residential construction. The underlying data were obtained from Fachserie 18, Reihe 1.4 of the Federal Statistical Office.

¹⁶ A 2021 study commissioned by KfW Research has put the climate action investment needed to achieve climate neutrality in Germany by the middle of the century at EUR 5 trillion. If the necessary climate action investment is spread out over the years remaining until the target year, EUR 190 billion will need to be invested on average each year. A large portion of this investment,

around 90% in total, must come from the private sector. Businesses, in turn, traditionally account for roughly 70% of private sector investment. That means enterprises must undertake roughly EUR 120 billion in positive investments on average each year. If we use this as a benchmark, there was an investment shortfall of around EUR 48 billion for the business sector for the year 2022.

¹⁷ Total climate investment by large enterprises is determined from the information they supply on the proportion of climate investments in their overall investments (approx. 15% in the year 2022 for large enterprises), which is multiplied by the total volume invested by large enterprises. The sum of total investments of large enterprises (with an annual turnover of more than EUR 500 million) is determined by subtracting the volume calculated for SMEs from the corresponding value for the entire business sector. The investment volume in the SME sector is surveyed in the context of the KfW SME Panel. Plausibility considerations underpin the value so determined for the climate investments undertaken by large enterprises. For example, if we were to assume, as an approximate solution, that the 50% share represented by large enterprises in the total investment undertaken by the entire business community could be applied one-to-one to the subsegment of climate action investments, large enterprises would contribute approx. EUR 36 billion. Alternatively, it could be assumed large enterprises invest in climate action in the same proportion to total investment as the SME sector (approx. 15% for 2022). In that case, the balance would be around EUR 36 billion. For more on total investment by the business sector, large enterprises and SMEs, see Schwartz, M., and Gerstenberger, J., (2023), KfW SME Panel 2023: SMEs' resilience is being put to the test. So far, they have come away with few bruises, but now they are increasingly nervous, KfW Research.

¹⁸ The investment volume in the SME sector is surveyed in the context of the KfW SME Panel. See Schwartz, M., and Gerstenberger, J., (2023), KfW SME Panel 2023: SMEs' resilience is being put to the test. So far, they have come away with few bruises, but now they are increasingly nervous, KfW Research

¹⁹ Cf. Grewenig, E. and Römer, D. (2023): Der Unternehmensfuhrpark – ein wichtiger Hebel für die Klimaneutralität (The company vehicle fleet – an important lever for climate neutrality – in German only), Focus on Economics No. 437, KfW Research.

²⁰ Cf. Schwartz, M., and Gerstenberger, J., (2023), KfW SME Panel 2023: SMEs' resilience is being put to the test. So far, they have come away with few bruises, but now they are increasingly nervous, KfW Research.

²¹ For an analysis of investment barriers in the SME sector, see also Gerstenberger J., Grewenig E., and Lo, V. (2023): Vielfältige Hemmnisse bremsen Klimaschutzinvestitionen im Mittelstand (*A range of obstacles slow climate investment by SMEs* - in German only). Focus on Economics No. 440, KfW Research.

²² Cf. Abel-Koch, J., Brüggemann, A., Köhler-Geib, F., Kohn, K., Lo, V., Schwartz, M. and Schwarz, M. (2022), KfW Climate Barometer 2022. In 2021, German enterprises invested around EUR 55 billion in climate action – still too little to reach climate neutrality, KfW Research.

²³ For further details see also Gerstenberger J., Grewenig E. and Lo, V. (2023): Vielfältige Hemmnisse bremsen Klimaschutzinvestitionen im Mittelstand (*A range of obstacles slow climate investment by SMEs* - in German only). Focus on Economics No. 440, KfW Research.

²⁴ Cf. Abel-Koch, J. (2023): KfW-Internationalisation Report 2023. Many SMEs currently perform better than their foreign competitors but see need for action to secure their future competitiveness. KfW Research.

²⁵ Cf. Brüggemann, A. and Levinger, H. (2022). Securing critical raw materials for the net zero and digital transformation. Focus on Economics No. 399, KfW Research.

²⁶ Cf. Müller, M. (2022): Skills shortage marks a turning point: The times of guaranteed growth are over, Focus on Economics No. 414, KfW Research

²⁷ Cf. Müller, M. (2023): KfW-ifo Skilled Labour Barometer June 2023: The skilled labour shortage: Economic downturn instead of improved supply, KfW Research and Peichl, A., Sauer, S. and Wohlrabe, K. (2022): Fachkräftemangel in Deutschland und Europa – Historie, Status quo und was getan werden muss (*Skills shortages in Germany and Europe – history, status quo and what needs to be done* – our title translation, in German), ifo Schnelldienst 75/2022, Munich.

²⁸ Cf. Grewenig, E. (2023). Mangelnde Digitalkompetenzen erschweren die Rekrutierung von Fachkräften in klimaaffinen Unternehmen (Shortage of digital

expertise hampers recruitment of skilled workers in climate-positive businesses – in German only), Economics in Brief No. 240, KfW Research.

²⁹ Cf. Römer, D. and Salzgeber, J. (2023): KfW Energy Transition Barometer 2023. Energy transition caught between need for action and financial possibilities, KfW Research.

³⁰ The extrapolation factors are established on the basis of the following four criteria: number of employees, sector, region and KfW support status (only for quantitative indicators). Several minor modifications merged in the preparation

of the extrapolation factors compared with the 2022 survey waves (for details see Volume of methods to the KfW Climate Barometer 2023). Where comparisons are made with the previous year, the corresponding figures of the previous year's publication are shown for reasons of consistency. A corresponding re-weighting of the previous year's figures would result in only marginal quantitative variations. The statements made would thus remain qualitatively unchanged.