

# »»» Municipal climate action investment: between growing needs and limited resources

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The increasingly obvious impact of climate change presents enormous challenges for Germany's private and public sector alike. If the climate targets are to be achieved, vast sums need to be invested in climate action. It is estimated that around one tenth of all public investment needed to achieve climate neutrality must come from the public sector and a large portion of it from local governments. Adapting public infrastructure to climate change also requires investment. Despite the urgency of the topic, however, there are still very few reliable figures or detailed information about priority fields of action for the necessary investment in climate change mitigation and adaptation in cities, communities and rural districts. The responses to the surveys conducted on the basis of the KfW Municipal Panel 2023 show that while 56% of municipalities are already addressing the future fiscal requirements for climate change mitigation and adaptation, 44% are not. Furthermore, around two thirds of municipalities are not involving their treasuries early in the design and implementation of sustainability and climate action strategies, so that the financial dimensions of climate investments flow into the financial programming only at a relatively late stage.

Overall, German municipalities with more than 2,000 inhabitants spent just under EUR 4 billion on climate change mitigation and adaptation in their core budget in the year 2021. But given the high investment needs and the recent sharp rises in the costs of construction and capital goods, this sum is unlikely to be sufficient to move forward on the path towards climate neutrality. It is estimated that municipalities need to invest at least EUR 5.8 billion per year, so it is obvious that more needs to be invested. Municipalities themselves also expect to spend more in the future. But the question remains how that expenditure can be funded. Fifty-one per cent of municipalities assume that only a small portion of the necessary additional investment can be provided in the existing system. So, there is a need to clarify not only the technical responsibilities and measures as well as funding volumes that need to be mobilised but also the funding channels and instruments. The surveyed municipalities primarily mentioned simplified promotional programmes and more funding as starting points for stepping up municipal climate action investment.

## **Municipalities are key actors in climate action in Germany**

The goal of making Germany climate neutral by 2045 while managing the impact of climate change requires enormous

efforts and profound transformations in all areas of society. Municipalities are a core element of the public sector and responsible for setting the economic framework and living conditions of local inhabitants. Rural districts, cities and communities also play a prominent role in climate change mitigation and adaptation.

Municipalities can contribute to climate action and the reduction of greenhouse gases in many different ways. Thus, municipalities were recently responsible for around 30% of all public investment and even around 60% of public construction projects.<sup>1</sup> Municipalities have responsibility for many public tasks in the sectors in which the largest climate efforts are needed in Germany.<sup>2</sup> These include, for example, roads and transport infrastructure, public administrative buildings, schools as well as sporting facilities and swimming pools, almost all of which are under the responsibility of municipalities. In the year 2018, the number of municipal buildings was estimated at nearly 180,000, which means that nearly two thirds of public energy consumption occurs at municipal level.<sup>3</sup> According to current estimates, up to 38% or 280 million tonnes of total greenhouse gas emissions in Germany can be attributed to the municipal sector both directly and indirectly – through municipal companies and participations. It is also estimated that municipalities can reduce their emissions by around one third or 101 million tonnes.<sup>4</sup> Besides, a municipality can indirectly influence climate action decisions of municipal enterprises in which it has a stake. Many infrastructure decisions that pave the way for climate action are therefore made at municipal level.

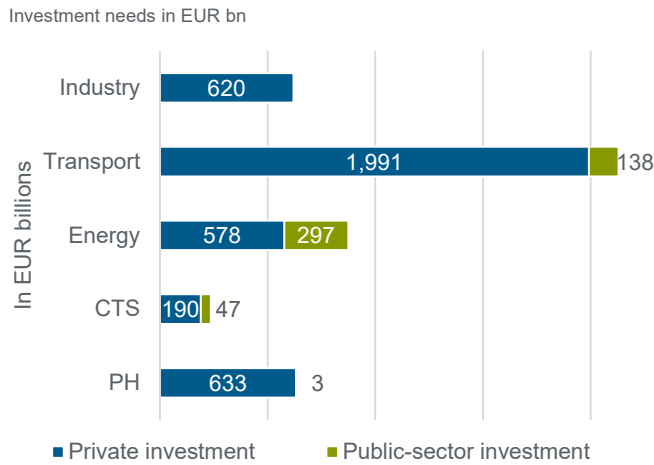
A municipality can also promote climate action by members of the public and businesses on the basis of its planning sovereignty or advisory services.<sup>5</sup> Not least, it is therefore mainly the municipal administrations and local policymakers who have a detailed picture of the local infrastructure and, hence, know particularly well what actions are needed and what options are available, and who can communicate them to the public.<sup>6</sup>

## **The public sector needs to continuously invest more in climate action**

In addition to creating business conditions that promote climate neutrality, the state itself must also take action by investing.<sup>7</sup> An analysis conducted on behalf of KfW Research estimates that around EUR 5 trillion will need to be invested across the aggregate economy by the middle of the century in

order to make Germany climate neutral.<sup>8</sup> Nearly EUR 500 billion or around 10% of this sum will have to come from the public sector, with the energy, transport and building sectors accounting for the bulk of public investment (Figure 1).<sup>9</sup>

**Figure 1: Private and public-sector investment required to achieve climate neutrality, by sector**



Note: The figure shows the total investment (required 'anyway' and 'additionally') to reach climate neutrality by 2045 by economic sector (CTS = commerce, trade, services; PH = private households)

Source: Brand, S. and Römer, D. (2022).

**Municipalities must also advance climate change adaptations**

Municipalities must also prepare for the impact of climate change.<sup>10</sup> For example, many cities and communities have been historically located on rivers or coastlines, making them vulnerable to extreme weather events. Rising costs from climate damage are already being recorded and affecting public budgets.<sup>11</sup> Therefore, in addition to expenditure on climate change mitigation, municipalities are spending increasingly more on climate change adaptation measures, and the less progress is made on climate action today, the higher these costs will be in the future.<sup>12</sup>

Efficient climate action and proactive climate risk management require a detailed assessment of what actions need to be taken and where, and what investment is required. Despite the relevance of the topic, there are hardly any reliable figures or concrete information on future municipal investment requirements for climate action and climate change adaptation.<sup>13</sup> The municipalities were therefore surveyed about these issues under the KfW Municipal Panel 2023 in order to obtain a detailed picture of the municipalities' current situation and future plans with respect to climate action and climate risks.<sup>14</sup> The results are published in advance in this short study.

**Climate action and climate risks are becoming more relevant for municipal budgets**

As the issues of climate change mitigation and adaptation already have high relevance and will foreseeably become even more relevant, so, too, will it become increasingly urgent to obtain a more precise picture of the need for and feasibility of investments in municipal budgets. After all, municipal

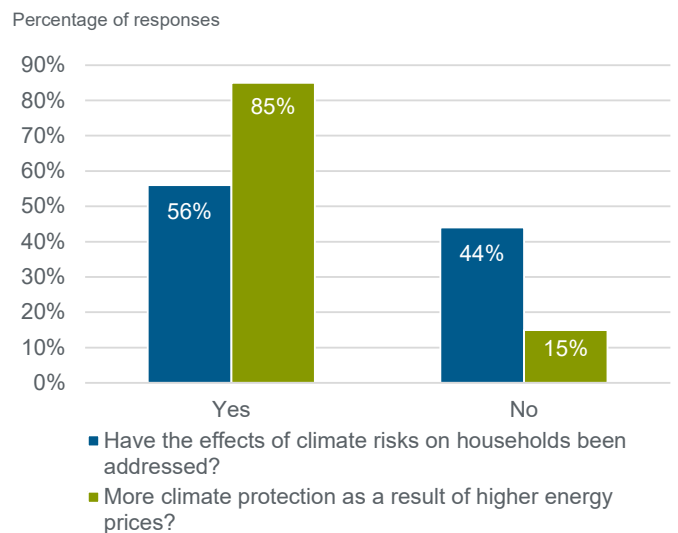
budgets (and, hence, treasuries) perform an important steering function in the portfolio of functions of the cities, communities and rural districts. Only if the necessary funds are made available can the capacities required for climate change adaptation be maintained and measures implemented. This involves permanent adjustments in the structure of municipalities' budgets and functions as well as the provision of one-off funds. Besides incorporating climate action aspects in regular day-to-day business, many one-off investments to implement the social-ecological transformations must be carried out in the coming years.

However, the responses to the survey show that just slightly more than half of all treasuries have so far explicitly taken into account the fiscal risks of climate change. At present, 56% of municipalities with more than 2,000 inhabitants are addressing the consequences of climate change mitigation and adaptation for their budgets, while these considerations play a subordinate role at best in 44% of municipalities (Figure 2).<sup>15</sup>

However, the impact of climate change mitigation and adaptation measures on the budget is likely to play an increasingly important role for many municipalities in the future, given that 85% of the surveyed treasuries believe that climate change mitigation and adaptation investments will gain importance as a result of the current energy crisis.

**Figure 2: Many municipalities are not yet addressing climate risks in fiscal terms, but climate action is gaining importance**

Questions: Does your municipality's treasury/finance department address the issues of climate change mitigation and adaptation with a view to future impacts on the budget? (blue bar) Are current energy prices driving your municipality to invest more in climate change mitigation and adaptation (... e.g. by reducing energy consumption or using alternative forms of energy)? (green bar)



Source: KfW Municipal Panel 2023.

**Municipal investment must increase in order to achieve the goal of climate neutrality**

Around three fourths of the climate-relevant investment already undertaken by municipalities has been directed at climate change mitigation and around one quarter at adaptations (see box for definition of terms).

### Box: Investment in climate change mitigation and adaptation

The terms were defined in the survey as follows: Municipal investment in **climate change mitigation** includes all public investments (without maintenance expenditure) in fixed assets but also in intellectual property (such as software or data bases) that are in the possession of the municipality, made from the core budget and serve the objective of climate change mitigation. Climate change mitigation refers to all measures aimed at reducing greenhouse gas emissions or capturing greenhouse gases.<sup>16</sup>

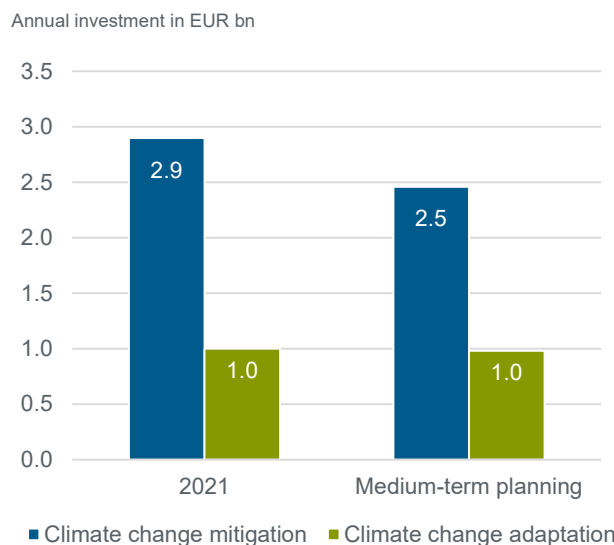
Municipal investment in **climate change adaptation** includes all investments (without maintenance expenditure) in fixed assets but also in intellectual property (such as software or data bases) that are in the possession of the municipality, made from the core budget and serve the objective of climate change adaptation. These include all measures that limit the negative effects of climate change (increased extreme weather events such as heavy rainfall, storms, heat and drought), reduce possible damage and thereby increase climate resilience.<sup>17</sup>

According to estimates made under the KfW Municipal Panel, municipalities with more than 2,000 inhabitants in Germany spent a total of around EUR 2.9 billion on climate action measures in the core budget in the year 2021.<sup>18</sup> Similar volumes averaging around EUR 2.5 billion per year are planned for the coming years in the medium-term financial planning (Figure 3). Municipalities estimate around EUR 1 billion per year for climate change adaptation – both in 2021 and on average per year in the medium-term financial planning. Thus, climate action accounted for around 11% of all municipal investment made in 2021, or 15% including expenditure on climate change adaptation.<sup>19</sup>

How should these figures be assessed? In general, there is still great uncertainty about the level of municipalities' climate-relevant investment requirements.<sup>20</sup> This uncertainty also stems from the difficulty of capturing the investments made between the public areas and sectors.<sup>21</sup> As a rough estimate, it can be assumed that around one third of the total public investment amounts can be attributed to municipalities.<sup>22</sup> If this ratio is also applied to climate action investment, the municipal level would have to invest around EUR 5.8 billion annually to provide its contribution to the climate targets by the year 2045.<sup>23</sup>

The values extrapolated for 2021 on the basis of the present survey reflect around half of this sum, although it must be borne in mind that the underlying estimate of the investment requirements is based on price levels that are significantly below the current ones, for example in the construction sector. The volume of investments currently undertaken the municipalities is therefore likely to be below this mark.

Figure 3: Municipalities dedicated around 11% of their investment expenditure in the year 2021 to climate action



Note: The bar 'Medium-term financial planning' shows the average annual investments in the medium-term financial planning.

Source: KfW Municipal Panel 2023.

Besides, a large portion of municipal functions is performed by public enterprises or participations.<sup>24</sup> If we also count outsourced municipal operations – such as utilities or public transport companies, provided the treasuries possess data on their investment projects – investment in climate action in 2021 rose to EUR 4.8 billion in total, which is much closer to the target of EUR 5.8 billion. Nevertheless, it needs to be noted that outsourced operations do not need to be 100% public and often are not, especially in larger municipalities.<sup>25</sup> These investments therefore cannot be fully attributed to the public or municipal level.

Furthermore, almost all needs assessments are based on the assumption that investment paths will rise over time, also because more costly measures were typically deferred in the past. An annual average conceals the growing requirements, so we need to focus not so much on the absolute investment expenditure in a particular year but rather on the required growth rates. Only if the public sector embarks on a continuously rising development path in its investment activity can it effectively expand its climate action investment to the level required in the future in the first place – both financially and in terms of its human resource capacities.

### Building refurbishment and photovoltaic systems account for the largest investment volumes

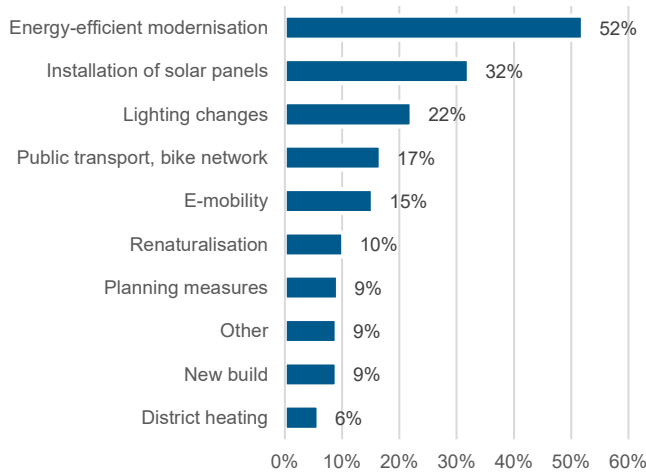
The municipal budgets have already allocated considerable sums to climate change mitigation and adaptation measures. Asked about the three largest climate action investment projects of the last three years, around half the responding municipalities mentioned energy-efficient modernisation of buildings (52%). For just under one third (32%), the installation of photovoltaic (PV) systems was among the financially most demanding projects and for around 22% of municipalities it was the conversion of lighting to LEDs (Figure 4). Investments in mass public transport and cycling infrastructure were mentioned by 17% and measures to expand electric mobility by 15% of responding municipalities. Other measures such as renaturation or the construction of new energy-efficient

buildings were among the most financially demanding investment projects for less than 10% of municipalities.

**Figure 4: Building rehabilitation and installation of PV systems are the most financially demanding climate action projects**

Question: Please state the three climate action investment measures with the largest investment volume that your municipality (core budget and outsourced operations) has completed in the past three years (open question).

Percentage of responses, multiple responses were possible



Source: KfW Municipal Panel 2023.

The most frequent climate action investments mentioned were flood risk management and intense rainfall protection measures (41%), primarily in the form of direct construction measures, but also renaturalisation. Renaturalisation (22%), building refurbishment (17%) and thermal protection (12%) measures were also mentioned relatively often. Even so, 22% of responding municipalities explicitly did not put in place any climate change adaptation measures in the past three years.

**The vast majority of municipalities expect rising climate change mitigation and adaptation investment requirements**

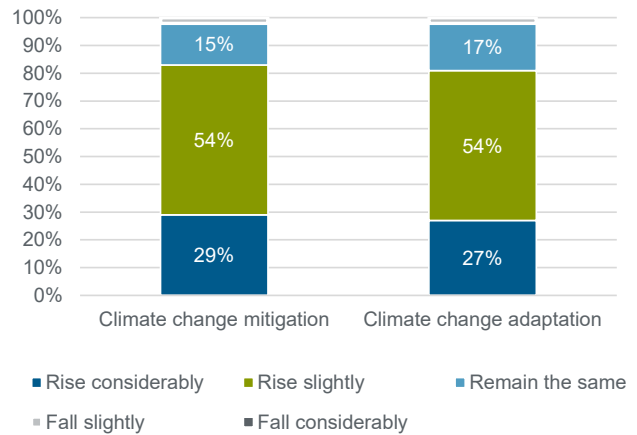
The vast majority of municipalities expect their expenditure on climate change mitigation as well as adaptation to rise in the future. Around 54% of municipalities anticipate that their climate change mitigation expenditure will increase slightly, while a further 29% expect strong increases (Figure 5). They share similar views on adaptation, with 54% of municipalities expecting rising and 27% sharply rising expenditure.

Asked about the reasons for rising investment volumes, the majority of municipalities (59%) mentioned a high level of ambition to avoid carbon emissions as a result of greater awareness of the problem (Figure 6). Increased energy and construction prices were the second most frequently mentioned reason. High energy prices create incentives to invest in energy-efficient infrastructure in order to reduce running costs.<sup>26</sup> At the same time, increased construction prices are making investments significantly more expensive, however, eating up expected savings achieved elsewhere.<sup>27</sup> Around one fifth of the surveyed municipal treasuries mentioned rising costs resulting from extreme weather events or corresponding protection measures as the reason for rising levels of climate change adaptation expenditure.

**Figure 5: More than 80% of municipalities expect rising investment expenditure on climate change mitigation and adaptation**

Question: How do you expect future investment volumes in the area of climate change mitigation and adaptation (core budget and outsourced operations) to develop in the medium term?

Percentage of responses



Source: KfW Municipal Panel 2023.

A notable 17% of municipalities mentioned policy requirements imposed by higher levels as cost drivers. This shows that a higher level of ambition at federal and state level ultimately has effects on the municipal level as well. Aspects such as the existing investment backlog, the need to expand capacity in administration or other reasons were mentioned by (sometimes significantly) fewer than 10% of municipalities. This shows that comparable obstacles that also prevent a significant expansion of investment activity in other infrastructure areas are also emerging for climate change mitigation and adaptation, although they do not appear to have the same urgency yet here.<sup>28</sup> It is possible that these aspects are not yet being perceived as key barriers because financial restrictions are preventing more extensive climate action investments for the time being. If these financial restrictions could be eliminated, other barriers such as the shortage of staff and expertise could play a larger role than before.<sup>29</sup>

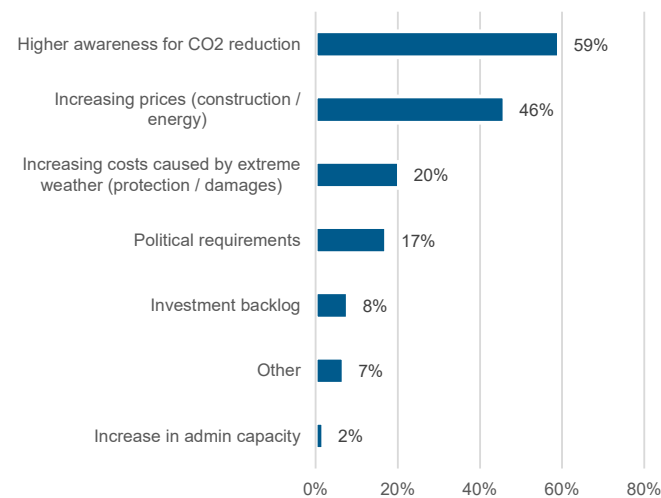
The findings also illustrate the ambivalence of increasing investment volumes. On the one hand, the responses point to a higher level of climate action ambition. On the other hand, rising prices mean that more needs to be invested without more being achieved for climate change mitigation or adaptation in real terms as a result. Higher investment expenditure alone does not necessarily allow the conclusion that municipalities are making substantial inroads on the pathway to climate neutrality.

With a view to achieving efficient climate change mitigation and making municipal infrastructures more climate resilient, what is needed besides continuously rising investment amounts in real terms is an efficient impact monitoring in order to be able to ascertain whether the necessary transformations have been implemented and the planned climate change mitigation and adaptation outcomes have been delivered.<sup>30</sup>

**Figure 6: Higher level of ambition and rising prices lead to higher investments**

Question: Assuming you expected increasing investment volumes, what do you see as the most important causes for this increase (open question)?

Percentage of responses, multiple responses were possible



Source: KfW Municipal Panel 2023.

**For more than 60% of municipalities, funding the required investments is a major challenge**

As investment in climate change mitigation and adaptation already amounts to around 15% of investment expenditure – measured by the levels of the year 2021 – and the majority of municipalities anticipate a continuing rise in investments, questions also arise as to how these additional investments are to be funded. In 2021, municipalities funded nearly half the total investments from their own resources (36%, primarily from own tax revenue and key allocations from the municipal fiscal equalisation systems) and purpose-tied investment allocations. Promotional funds and municipal loans each made up 25% of the funding volume.<sup>31</sup>

As municipalities cannot increase their own funds at will, they will need either investment subsidies and promotional funds or more debt capital in order to increase their investment expenditure. To be sure, most municipalities would be able to borrow more even in the current environment of rising interest rates.<sup>32</sup> But there are relatively tight economic and legal budgetary limits to increasing debt levels.<sup>33</sup>

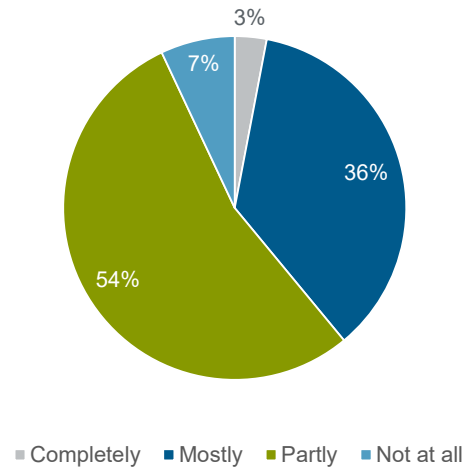
The views of the treasuries reflect these restrictions. Only 3% of those surveyed believe they will be able to fully cover the rising investment volumes in future budgets, while a further 36% at least expect to be able to meet a large portion of their requirements (Figure 7). But more than 60% of municipalities expect the opposite. Fifty-four per cent expect to be able to realise only a small portion of the required investment and 7% of municipalities believe they will not be able to meet their needs at all.

The views on the funding mix also tell a similar story. Around half the municipalities (49%) believe that the current mix of own funds, subsidies, promotional funds and borrowed funds is suitable for securing future investments in climate change mitigation and adaptation, while 51% of municipalities believe the current funding mix is not suitable.

**Figure 7: More than 60% of municipalities believe that they can meet none or only part of their investment requirements in future**

Question: Assuming you expect investment volumes to rise, will you be able to actually mobilise the necessary financial resources for climate change mitigation and adaptation in the competition for budget allocations with other budgetary items?

Percentage of responses



Source: KfW Municipal Panel 2023.

**Better funding and a more effective promotional landscape can strengthen climate action**

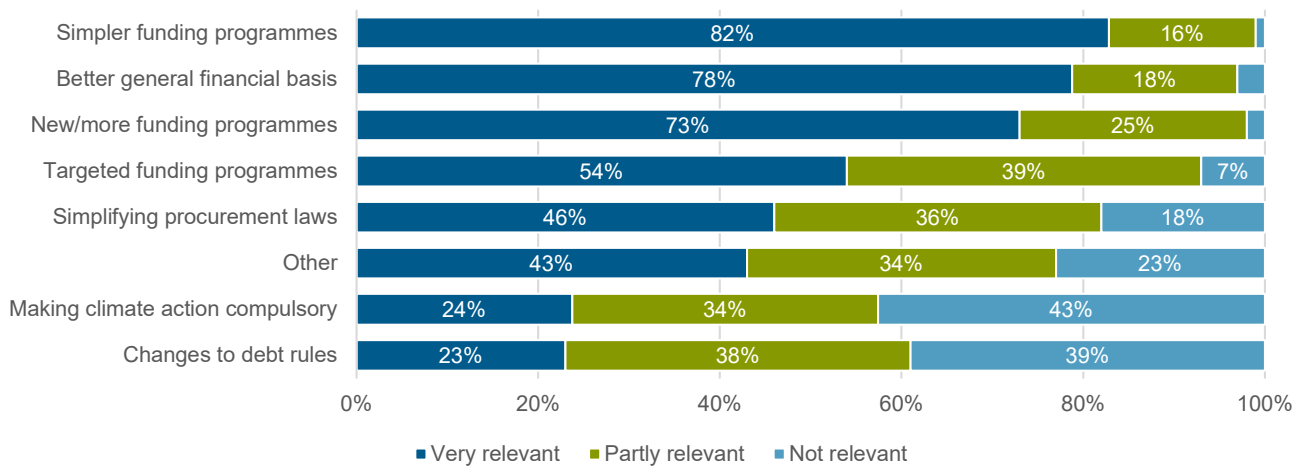
Asked about the instruments that would make it easier to invest more in climate action, municipalities primarily mentioned an improved promotional landscape that would be characterised by simpler, additional and more targeted promotional programmes. Better funding in general was also mentioned often. This applies to the general views of all surveyed municipalities (Figure 8) as well as to the open answers given by the municipalities that regard the current funding mix as unsuitable.<sup>34</sup> Almost half of municipalities (46%) regard a simpler public procurement law as very relevant for stepping up climate action. Classifying climate action as a compulsory task or adjusting debt regulations, however, are regarded as very relevant by less than one fourth and not relevant by around 40% of municipalities.

These findings reflect the environment in which municipalities currently operate. At present, climate change mitigation and adaptation are discretionary cross-cutting tasks.<sup>35</sup> The often debated question whether these areas of activity should become mandatory municipal tasks in the future is therefore overshadowed by the much more fundamental question whether and how the funding can be secured to complete these tasks.<sup>36</sup> Thus, although in some cases specific tasks such as the planning of heating are already being transferred to the municipal level, making them compulsory, the principle of connectivity and, hence, of adequate funding for the task is typically observed only in part.<sup>37</sup> The same applies to debt rules. Even if municipalities were allowed to take up more loans as a result of changes to rules on budgetary debt, this would not automatically result in greater capacity to take on debt without at the same time improving municipalities' revenue base.<sup>38</sup>

Figure 8: Better funding and an improved promotional landscape can help step up climate action

Question: In your opinion, how relevant are the following overarching policy measures for you to intensify your municipality's climate change mitigation and adaptation efforts in the future?

Percentage of responses



Source: KfW Municipal Panel 2023.

**Conclusion: Achieving the climate targets requires changes at many levels, including in municipalities**

Even if the climate change mitigation investment that needs to be made by the middle of the century cannot be precisely quantified, it has nevertheless become clear that the existing level of municipal investment is unlikely to be sufficient and needs to be greatly increased to achieve the climate targets. Climate change adaptation, too, will require further substantial investment at municipal level.

None of this can be achieved with the existing human or financial resources under the current system. A wide range of reforms are therefore needed. For one thing, they will have to provide clarity about the specific measures which municipalities need to contribute to the nation's overall climate targets. For another, clarifications are necessary not just regarding the responsibilities in the federal state but also with respect to the staffing and financial resources which municipalities need to meet the tasks that lie ahead. Besides the lack of clarity about funding, the shortages of staff and skilled workers are increasingly turning out to be a key constraint to implementing the transformative tasks. Investments and personnel or skills, which do not necessarily need to be maintained by each municipality but must be readily available to all, must be understood as complementary. Both depend on what financial resources municipalities can expect to have at their disposal with sufficient planning certainty for the future.

As is the case with regard to the many other public services which municipalities provide and further investment needs, reliable and sufficient municipal funding is the best guarantor for municipalities to be able to also rise up to the local challenges of climate change through their own efforts.<sup>39</sup>

**The KfW Municipal Panel 2023**

The KfW Municipal Panel is based on a nationally representative survey of treasuries of cities and municipalities with more than 2,000 inhabitants and of all rural districts that is carried out annually by the German Institute for Urban Affairs (Difu). The KfW Municipal Panel 2023 is published in mid-May 2023: [www.kfw.de/kommunalpanel](http://www.kfw.de/kommunalpanel).

See the summary in English here: [Municipalities and Infrastructure | KfW](#)

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<sup>1</sup> Cf. Federal Statistical Office (2022): Vierteljährliche Kassenergebnisse des Öffentlichen Gesamthaushalts (Quarterly cash results of the overall public budget – our title translation, in German), Fachserie 14 Reihe 2, 1st-4th quarter 2021.

<sup>2</sup> Cf. Paar, A. et al. (2022): Teilbericht Klimaschutzpotenziale in Kommunen - Quantitative und qualitative Erfassung von Treibhausgasminderungspotenzialen in Kommunen (Climate action potentials in municipalities – quantitative and qualitative identification of greenhouse gas mitigation potentials in municipalities – our title translation, in German), German Federal Environment Agency.

<sup>3</sup> Federal Ministry of Economics and Technology (2018): Energieeffizienz in Kommunen, Energetisch modernisieren und Kosten sparen: Wir fördern das (Energy efficiency in municipalities, energy modernisation and cost savings: we support this – our title translation, in German).

<sup>4</sup> Cf. German Federal Environment Agency (2022): Klimaschutzpotenziale in Kommunen - Quantitative und qualitative Erfassung von Treibhausgasminderungspotenzialen in Kommunen (Climate action potentials in municipalities – quantitative and qualitative identification of greenhouse gas mitigation potentials in municipalities – our title translation, in German).

<sup>5</sup> Cf. Hagelstange, J., Rösler, C. and Runge, K. (2021): Klimaschutz, erneuerbare Energien und Klimaanpassung in Kommunen – Maßnahmen, Erfolge, Hemmnisse und Entwicklungen – Ergebnisse der Umfrage 2020 (Climate action, renewable energy and climate change adaptation in municipalities – measures, achievements, barriers and developments – findings of the 2020 survey – our title translation, in German), Difu-Papers.

- <sup>6</sup> Cf. Arbeitskreis Kommunaler Klimaschutz (2023): Wege zur treibhausgasneutralen Kommunalverwaltung (*Pathways to greenhouse gas-neutral municipal administration – our title translation, in German*), Difu impulse paper March 2023, or Evans, B., et al. (2006): Governing local sustainability. *Journal of Environmental Planning and Management*, 49(6), 849–867.
- <sup>7</sup> The concept of investment cannot be defined precisely in this context. The relevant literature therefore provides different definitions that lead to diverse needs for action and funding. For an overview cf. Fluchs, S., Neligan, A. and Wendland, F. (2022): Klimaschutzinvestitionen. Begriffsbestimmung und Datengrundlage (*Climate action investment. Definitions and underlying data – our title translation, in German*). Expert report on behalf of KfW, Cologne Institute for Economic Research.
- <sup>8</sup> Cf. Brand, S., Römer, D. and Schwarz, M. (2021): Investing EUR 5 trillion to reach climate neutrality – a surmountable challenge, Focus on Economics No. 350, KfW Research. Of this sum, around EUR 1.9 trillion is additional investment beyond the investment requirements mentioned in the reference case.<sup>8</sup> The remaining amounts are investments that would be needed in any case and now have to be steered in a climate neutral direction. Cf. Prognos et al. (2021): Contribution of green finance to achieving climate neutrality in Germany (in German only), study commissioned by KfW.
- <sup>9</sup> Cf. Brand, S. and Römer, D. (2022): Öffentliche Investitionsbedarfe zur Erreichung der Klimaneutralität in Deutschland (Public investment required to achieve climate neutrality in Germany – in German), Focus on Economics No. 395, KfW Research.
- <sup>10</sup> The draft law on climate change adaptation currently provides for mandatory risk analyses at local level, cf. N.N. (2023): Draft law on adaptation to extreme weather events: Umweltministerium plant Klimarisiko-Check für ganz Deutschland (*Environment Ministry plans climate risk check for all of Germany – our title translation, in German*), Der Spiegel, 24 March 2023.
- <sup>11</sup> The expected annual follow-on costs of climate change in Germany in the period from 2022 to 2050 are will rise at an increasingly faster rate over time and will eventually amount to EUR 280-900 billion, cf. Federal Ministry for Economic Affairs and Climate Action (2023): Kosten durch Klimawandelfolgen in Deutschland (*Costs resulting from the impact of climate change in Germany – our title translation, in German*). Expenditures on climate action are therefore not sunk costs but can pay for themselves in the form of reduced climate damage or 'green growth'. cf. Bär, H. et al. (2023): Klima- und Finanzpolitik zusammendenken: Wechselwirkungen und Zielkonflikte (*Bringing climate policy and fiscal policy together: interactions and trade-offs – our title translation, in German*). Nachhaltige Soziale Marktwirtschaft Focus Paper #7, Bertelsmann Stiftung.
- <sup>12</sup> The correlation is also laid out in the German adaptation strategy (DAS) which takes the federal level as a starting point and seeks to structure and promote the state's climate change adaptation activities, see initial publication: German Federal Government (2008). German Strategy for Adaptation to Climate Change. The federal states and many municipalities now have similar strategic approaches as well.
- <sup>13</sup> Cf. Raffer, C. (2023): Kommunale Investitionen für Klimaschutz und -anpassung: Finanzielle Dimensionen und Rolle der Kämmerereien (*Municipal investments in climate action and adaptation: financial dimensions and role of the treasuries – our title translation, in German*). Expert opinion commissioned by KfW Group, Difu-Impulse 3/2023.
- <sup>14</sup> As the treasuries are not the line ministries responsible for climate action, and since it is also unclear whether the municipal budgeting allows immediate conclusions to be drawn about their investments in the cross-cutting areas of climate action and adaptation, the survey under the KfW Municipal Panel was preceded by a short report that showed to what extent and whether municipal investment requirements for climate action/adaptation can even be surveyed at the level of individual communities. The result was that a large portion of municipalities do have a detailed overview of their investment activities for climate change mitigation and adaptation activities. For the report see: Raffer, C. (2023): loc. cit.
- <sup>15</sup> One reason that nearly half of municipalities are not yet explicitly addressing the fiscal risks to their budgets may be that only around one third of the surveyed treasuries have so far been involved in designing strategic concepts for implementing municipal sustainability and climate change adaptation strategies. Conversely, it can be surmised that the exchange of information on the development of strategies between the technical ministry and the financial administration is significantly limited in two thirds of municipalities.
- <sup>16</sup> These include measures aimed at reducing energy consumption, for example by insulating buildings, converting vehicle fleets, expanding bicycle lanes and (increasing) the use of regenerative energy sources such as photovoltaics, wind energy, biogas and geothermal energy. Measures aimed at capturing greenhouse gases can include, for example, the reforestation of municipal forests, the creation of new green spaces, the renaturation of peatlands, etc. To the extent that the investments of outsourced units are additionally of interest, this is explicitly surveyed.
- <sup>17</sup> These include measures such as the construction or reinforcement of reservoirs or dams, drainage systems, shading, greening and cooling systems. To the extent that the investments of outsourced units are additionally of interest, this is explicitly surveyed.
- <sup>18</sup> These amounts are likely to be rather conservative estimates because not all climate-relevant investments that form an integral part of a more comprehensive investment project can be calculated separately, so that they have not been fully reflected in the responses provided by the municipalities.
- <sup>19</sup> In the year 2021, municipalities with more than 2,000 inhabitants in Germany invested a total of around EUR 26,4 billion. Cf. Raffer, C. and Scheller, H. (2022): KfW Municipal Panel 2022, KfW Research.
- <sup>20</sup> There is little information about the level of funding required by public budgets, and some of it is very inconsistent; see for example German Council of Economic Experts (2021): Transformation gestalten: Bildung, Digitalisierung und Nachhaltigkeit – Jahresgutachten 21 (*Shaping the transformation: education, digitalisation and sustainability – annual report 21 – our title translation, in German*), Table 15, page 166. An initial estimate puts the federal, state and local governments' climate investment requirements for reducing greenhouse gas emissions by 65% compared with 1990 levels at EUR 460 billion by 2030. Of this sum, EUR 90 billion is for federal investment, EUR 170 billion for municipal investment and EUR 200 billion for promoting private investment; cf. Krebs, T. and Steitz, J. (2021): Öffentliche Finanzbedarfe für Klimainvestitionen im Zeitraum 2021–2030 (Public finance requirements for climate investment in the period 2021–2030 – our title translation, in German), Forum New Economy Working Paper No. 03/2021. The different studies have a low level of comparability as each analysis is done with a different method. They differ in their inclusion of specific measures, financing and implementation responsibilities and in the definitions of key concepts and timeframes, so that the estimated amounts should at best be regarded side-by-side with regard to their rough scale and results orientation.
- <sup>21</sup> Therefore, neither can all foreseeable individual measures be identified at municipal level and thus quantified bottom-up, nor have the country's total climate targets been sufficiently broken down to the state and local government levels so that the amounts identified for the nation as a whole could be transferred top-down to the municipalities. Cf. KPMG (2023): Klimaschutz im öffentlichen Sektor – Warum Handlungsbedarf besteht (*Climate action in the public sector – why there is a need for action – our title translation, in German*), whitepaper.
- <sup>22</sup> The municipal share of around 30% of total public investment expenditure is used as an orientation value, which would correspond to roughly EUR 150 billion of the EUR 500 billion of public investment required to achieve climate neutrality by 2045; cf. Brand, S. and Römer, D. (2022) loc cit: Other studies arrived at higher but comparable amounts, cf. Krebs, T. and Steitz, J. (2021): loc. cit., which estimated EUR 170 billion for the 65% target by 2030.
- <sup>23</sup> This assumes municipal investment requirements of EUR 150 billion in the period from 2019 to 2045, which corresponds to an average annual nominal requirement of EUR 5.8 billion. Not included are any rising investment requirements over time nor price effects.
- <sup>24</sup> Cf. Brand, S. and Steinbrecher, J. (2019): Kommunale Auslagerungen: ein Spiegelbild regionaler Vielfalt in Deutschland (Outsourced municipal operations: a reflection of regional diversity in Germany – in German), Focus on Economics No. 268, KfW Research.
- <sup>25</sup> Cf. Brand, S. and Steinbrecher, J. (2019): loc cit.
- <sup>26</sup> Cf. Brand, S. et al. (2022c): Municipalities are being hit by rising energy prices and responding in different ways, Focus on Economics No. 381, KfW Research.
- <sup>27</sup> Cf. Brand, S. and Salzgeber, J. (2022a): Baupreisanstieg und mögliche Zinswende: Hürden für Kommunalinvestitionen (Construction price increases and possible interest rate turnaround: barriers for municipal investment – in German), Focus on Economics No. 373, KfW Research.
- <sup>28</sup> Cf. Brand, S. and Salzgeber, J. (2022b): Knappe Personalkapazitäten erschweren Ausweitung kommunaler Investitionen (Scarce staff capacities hamper expansion of municipal investments – in German), Focus on Economics No. 375, KfW Research. or Scheller, H., Ritzler, K., Raffer, C. and Kühl, C. (2021): Baustelle zukunftsfähige Infrastruktur – Ansätze zum Abbau nichtmonetärer Investitionshemmnisse bei öffentlichen Infrastrukturvorhaben (*Building site sustainable infrastructure – Approaches to eliminating non-monetary investment barriers to public infrastructure projects – our title translation, in German*), Wiso Diskurs 12/2021.
- <sup>29</sup> A similar picture emerged in earlier surveys, for example in selected investment areas such as school buildings, where financially strong municipalities mentioned staff shortages as a driver of the investment backlog significantly more often than financially weak ones, which addressed financial constraints more often. Cf. Brand, S., Krone, E. and Steinbrecher, J. (2019): Kommunaler Investitionsrückstand bei Schulen: Was steckt genau dahinter? (Municipal investment backlog in schools: what exactly is behind it? – In German) Focus on Economics No. 266, KfW Research.
- <sup>30</sup> Furthermore, a results monitoring would significantly facilitate the use of special financing instruments (green finance) for municipal climate action, cf. Brand, S. and Steinbrecher, J. (2021a): Sustainable finance in German municipalities: Can green municipal loans break the ice? Focus on Economics No. 339, KfW Research.
- <sup>31</sup> Cf. Raffer, C. and Scheller, H. (2022): KfW Municipal Panel 2022, KfW Research.
- <sup>32</sup> Cf. Brand, S. and Salzgeber, J. (2023a): Kommunalfinanzen in Zeiten steigender Zinsen (*Municipal finances in times of rising interest rates – our title translation, in German*), Wirtschaftsdienst, Year 103, 1st half-year, p. 55–61 or Brand, S. and Salzgeber, J. (2023b): Strukturelle Hemmnisse behindern Kommunalinvestitionen mehr als die Zinswende (Structural barriers hamper municipal investment more than the interest rate reversal - in German), Focus on Economics No. 415, KfW Research.
- <sup>33</sup> Cf. Brand, S. and Salzgeber, J. (2021b): Finanzierung öffentlicher Investitionen: Kredite allein helfen den Kommunen nicht (Financing public investment: loans by themselves will not help municipalities – in German), Focus on Economics No. 360, KfW Research.
- <sup>34</sup> Here, 69% responded that they would prefer simpler promotional programmes, 28% want better funding and 10% more favourable (promotional) loans. Other measures received fewer mentions, multiple responses were possible.

<sup>35</sup> Cf. KGSt (2022): Position der KGSt zu Klimaschutz und Klimafolgenanpassung in Kommunen. Was Verwaltungsführung und Politik wissen müssen (*Position of the KGSt on climate action and climate change adaptation in municipalities. What administrators and policymakers need to know* - our title translation, in German), Report No. 14/2022.

<sup>36</sup> Demands are repeatedly made to establish climate action as a municipal task, for example in Klima-Bündnis (2023): Klimaschutz und Klimaanpassung als kommunale Pflichtaufgabe(n) verankern – Positionspapier des Klima-Bündnis für die deutsche Bundes- und Landespolitik (*Establishing climate change mitigation and adaptation as a compulsory municipal task – position paper of the Klima-Bündnis for German federal and state policy* – our title translation, in German). For more, please see: Scheller, H. and Raffer, C. (2022): Klimaschutz als kommunale Pflichtaufgabe! (Climate action as a compulsory municipal task! – our title translation, in German). In: Junkernheinrich, H. et al. (eds.): Jahrbuch für öffentliche Finanzen 1-2022, p. 352ff, for a more critical view: Diemert, D. (2022): Kommunaler Klimaschutz als Pflichtaufgabe? – eine Erwiderung (*Climate action as a compulsory municipal task? A response* - in German), in: loc cit., p. 378ff.

<sup>37</sup> Cf. Verheyen, R and Hölzen, K. (2022): Kommunaler Klimaschutz im Spannungsfeld zwischen Aufgabe und Finanzierung am Beispiel der kommunalen Wärmeplanung und des kommunalen Klimaschutzmanagements (*Municipal climate action in the fraught area between function and funding, using municipal heating planning and municipal climate action management as an example* - our title translation, in German), legal opinion.

<sup>38</sup> Cf. Brand, S. and Salzgeber, J. (2021b): loc cit.

<sup>39</sup> Cf. Rietzler, K. (2022): Kommunen zentral für Jahrzehnt der Zukunftsinvestitionen, Wirtschaftsdienst (*Municipalities are central to the decade of future investments* - our title translation, in German), year. 102, 1st half-year, p. 27–30.