Public financing needs for the modernisation of Germany

Summary

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Our articles and proposals are aimed at political decision-makers, at academics and the media, and the next generation of thinkers and citizens. With our work we aim to broaden public debates and support an inclusive process of political will formation.

The core values guiding all our work are **democracy, dignity, and widespread prosperity.**

This is a translated summary. The full study is available in German on our website.

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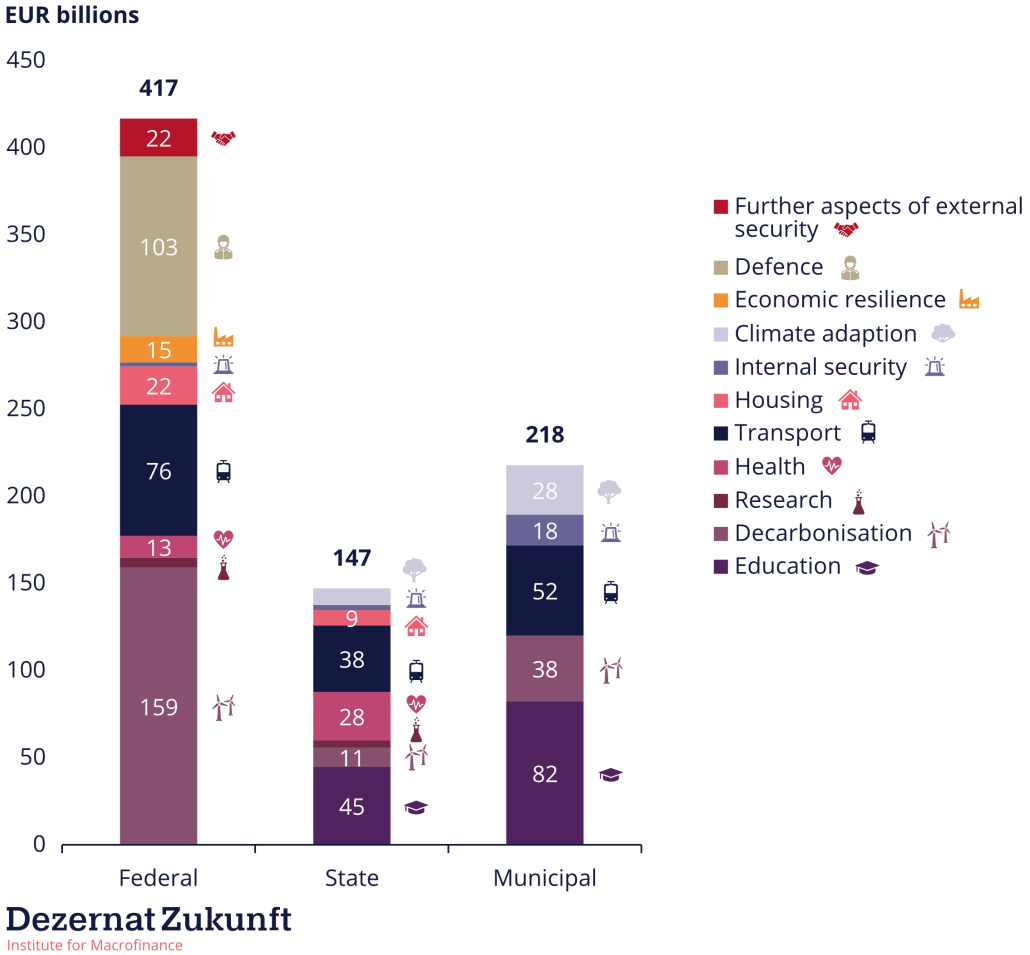
Executive Summary

Germany is currently facing a series of concurrent crises and a considerable modernisation backlog. In light of these challenges, the country is confronted with the historic task of implementing the necessary measures to ensure productivity, public services and security in the coming years. This also requires the targeted allocation of public financing. The objective of this study is to map the additional public financing required to achieve widely accepted targets in areas that are pivotal to Germany's stability and future. To the best of our knowledge, this represents the most comprehensive current analysis of public financing needs. Notably, we also cover the healthcare sector and, crucially, the substantial challenge of achieving defence-readiness.

Overall, we estimate an additional public financing need of 782 billion euros across the levels of government from 2025 to 2030. This would correspond to an average of around 3 percent of gross domestic product (GDP) per year. In the absence of cuts elsewhere, this would put Germany's level of government spending roughly on a par with Austria's and below Finland's. Our findings are consistent with and complement other estimates of public needs published this year. The need for significant additional public financing for the future viability and modernisation of the country can thus increasingly be seen as a consensus position.

Additional public financing needs to achieve widely accepted targets by 2030



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Introduction

Felix Heilmann, Dr. Florian Schuster-Johnson, Dr. Max Krahé, Sara Schulte, Janek Steitz, Philippa Sigl-Glöckner

Germany is facing a historic challenge. In the midst of overlapping crises, international conflicts and domestic political fragmentation, the country must make itself fit for the 21st century by making up for past failures and taking the necessary steps to modernise. The modernisation of an often outdated infrastructure, the overhaul of key foundations of public services, the forward-looking orientation of the economy, the safeguarding of defence capabilities and stability at home and abroad, and progress towards climate neutrality are tasks for society as a whole that can only be successfully tackled if all levels of government and, in particular, private actors, including companies, individuals and investors, are effectively involved.

This study specifically examines the role of public, i.e. government, funding for the steps necessary to accomplish these tasks. Based on extensive consultation with experts and our own research, we identify the minimum level of additional public financing needed between 2025 and 2030 to achieve widely accepted policy goals.

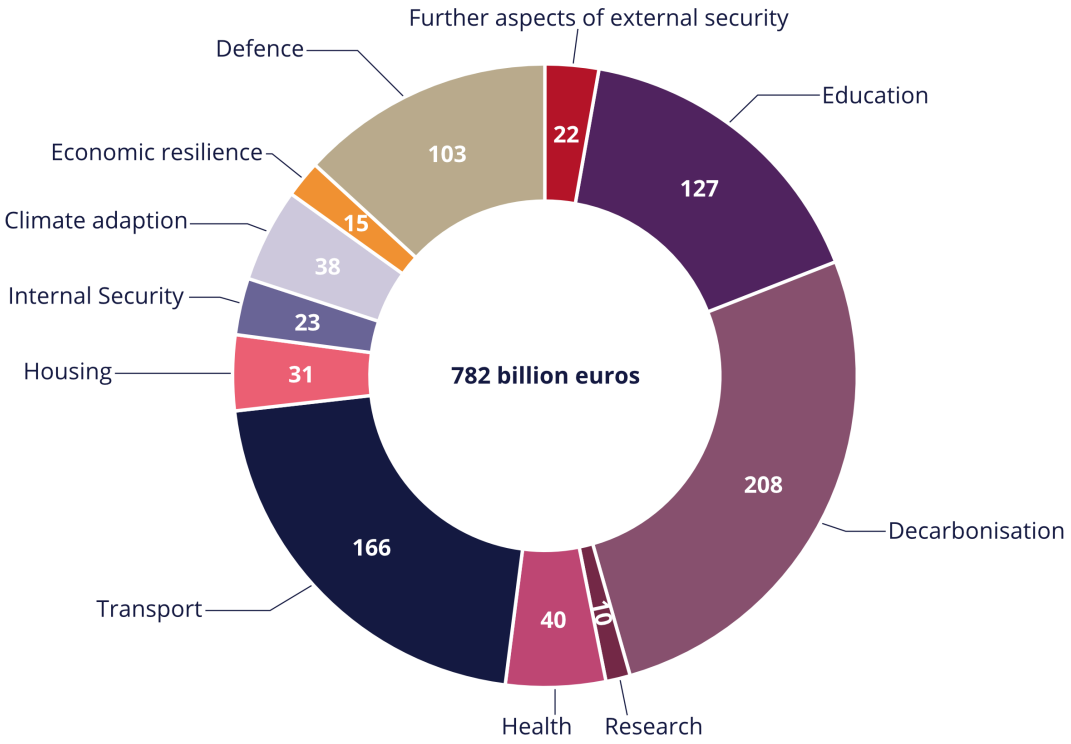
The results show that all levels of government - federal, state and municipal - are facing significant funding challenges. The annual financing needs we have calculated for each level of government amount to an average of 11 per cent of total current expenditure for the federal government, 5 per cent for the states and 10 per cent for the municipalities.[1] This corresponds to an average of around 3 percent of gross domestic product (GDP) per year. If all of the identified additional spending needs were realised, and assuming no budget cuts were made elsewhere, the level of government spending in Germany would be roughly the same as in Austria and below the level of government spending in Finland (measured as a share of GDP, see Eurostat 2024a).

Overall, we calculate an additional public financing need of 782 billion euros for the years 2025 to 2030 (Figures 1, 2). For the areas of decarbonisation and economic resilience respectively, we have calculated a range of financing needs. The total figure includes the lower range of needs for economic resilience and the average of the two scenarios calculated for decarbonisation.

1 Calculated as the share of additional financing needs in 2030 relative to the purchasing power-adjusted expenditure of the federal government, state governments and municipalities in 2023, adjusted for inflation to 2024 (Destatis 2024a). Allocation of the various needs to levels in government in accordance with principal responsibilities under the German federal system (see Methodology, p. 15-17).

Public financing needs to achieve widely accepted targets by 2030

2025-2030, in billions of euros (only additional needs)



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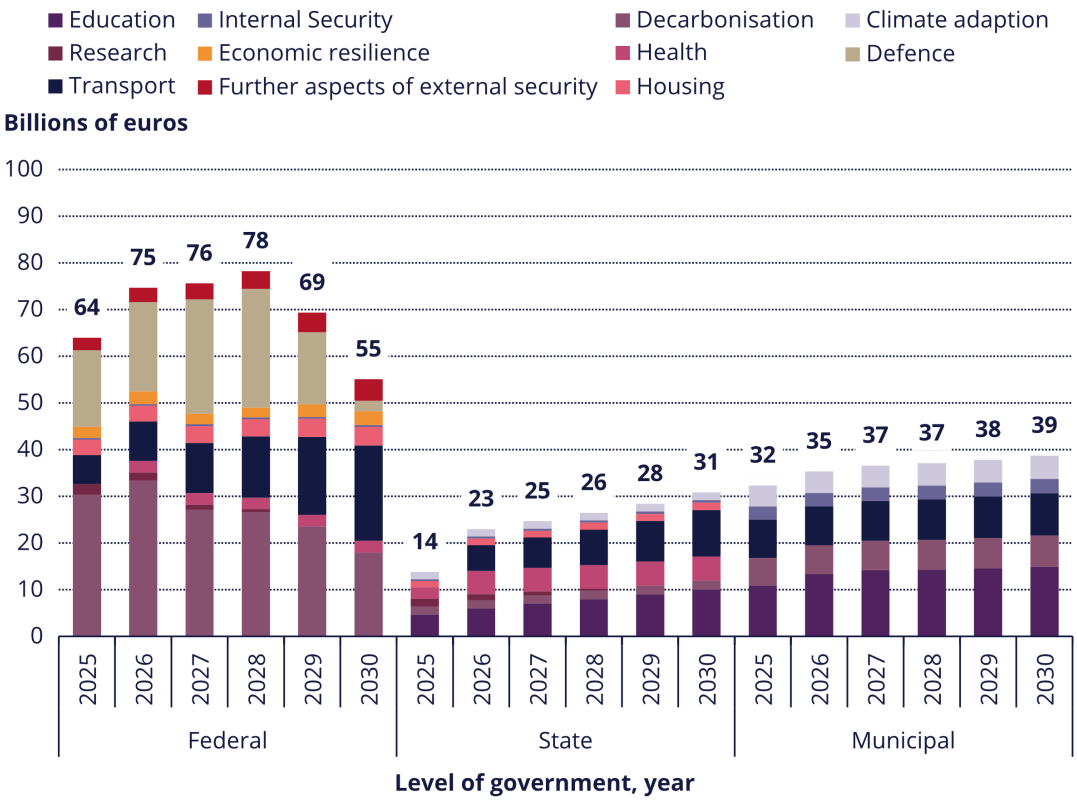

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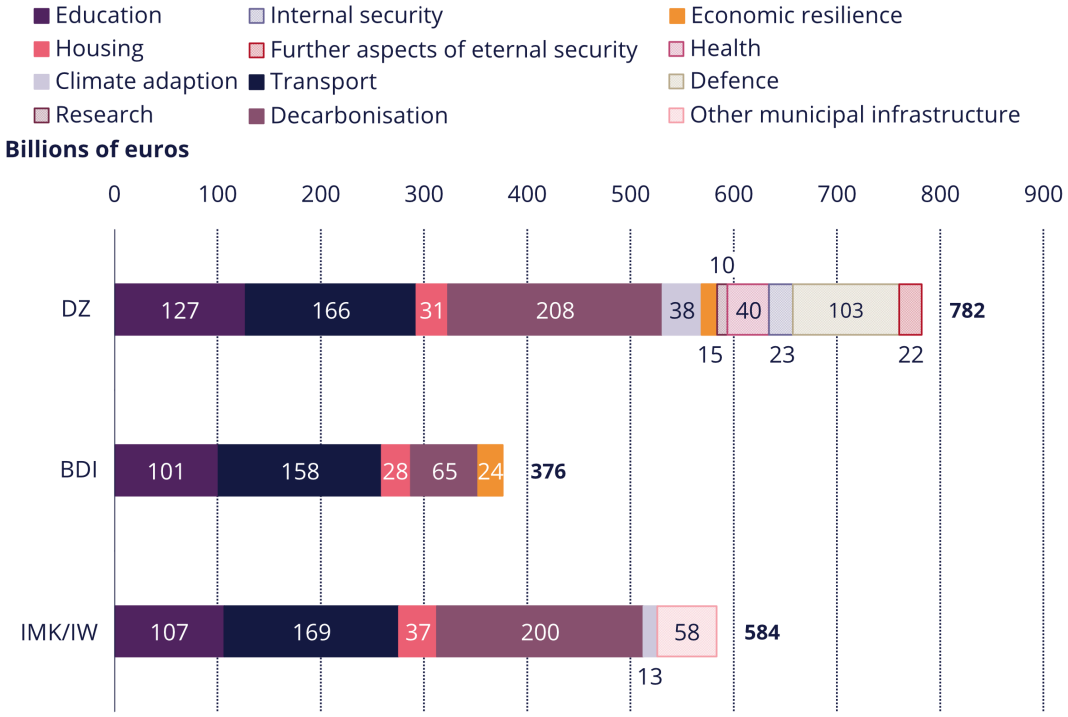
Figures 1, 2: Additional public financing needs 2025-2030; **source:** own calculations

There is a growing consensus that there is a significant need for additional public investment and financing in Germany. The results of our study - which is based on the achievement of widely accepted goals and was compiled on the basis of extensive consultations with experts and politicians from various parties - are in line with recent calculations by the Federation of German Industries (BDI), the Macroeconomic Policy Institute (IMK) and the German Economic Institute (IW) (BDI 2024; Dullien et al. 2024). Our higher total is the result of a more comprehensive analysis of government needs. For example, this study is the first to include a detailed bottom-up analysis of additional security and defence requirements. The differences between items assessed in all three studies are generally minor (Figure 3, for details see subsection 4, Comparison of results with other studies, p. 23-29).[2]

With this study, we aim to contribute to refocusing the fiscal policy debate on the achievement of societal goals. The question of how these goals are to be financed is not the subject of this study, which only identifies the financial requirements as a derivation of political and social objectives. The needs derived from this study are therefore the starting point for an open-ended discussion about which financing channels can best cover the identified needs in order to achieve the considered objectives. We make proposals in this regard in a separate and independent publication (Schuster et al. 2024), but the calculation of the additional financing needs as presented here stands on its own.

Comparison of different studies on (additional) public financing needs

Comparison of the results from Dezernat Zukunft (2024), BDI (2024) and IMK/IW (2024)



Areas covered by only one study are shaded. Economic resilience uses the lowest estimated need, BDI (2024) also includes location incentives for green technologies.

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Figure 3: Comparison of different studies on public financing needs; **sources:** BDI (2024), Dullien et al. (2024), own calculations

2 In the areas of health, research and internal and external security (including defence), which have not been covered in the other studies, we identify a total additional financing need of 198 billion euros.

The study is structured as follows: After explaining the methodological approach (p. 15), we briefly summarise the results for each expenditure area (p. 18; a summary table of all financing needs is provided on p. 22). We also compare our figures with those of other recent publications on similar topics (pp. 23ff.) and discuss the role of non-financial barriers to implementation (pp. 30ff.). The technical sections, which provide a comprehensive account of the derivation of each item, are not included in this translation. They can be accessed on our website in the original German.

1. Methodology

The research question of this study - "What are the additional public financing needs for Germany to achieve widely accepted goals between 2025 and 2030?" - provides the central methodological guidelines along which the study was prepared. These are as follows:

Additional needs

To provide as sound a basis as possible for budget planning processes, we have only identified additional needs over and above federal financing already allocated or planned, or, where appropriate, current expenditure and investment levels. Therefore, in cases in which we refer to overall estimates of financing needs, we have deducted corresponding appropriations. This is explained in detail in the relevant technical sections (available in the German original via our website).

Coverage of all federal levels of government

We cover all federal levels of government and allocate additional financing needs by federal level.[3] The additional needs identified have always been allocated to the level with primary responsibility for the function concerned, except in cases where there are clear decisions on a different future allocation.

Widely accepted targets

The starting point for determining the relevant targets is the overarching perspective of securing a good future, with a focus on the Federal Republic of Germany. To this end, we examined a total of twelve areas, structured into two clusters ("Productivity and public services" and "Security"). Nine of the twelve areas were defined by us at the start of the project, while three further areas were added in response to external feedback (see below).[4]

Exchanges with experts played a central role in identifying widely accepted targets within the spending areas. In total, we held over 70 technical discussions with experts from academia, the private sector and associations to identify the relevant targets and the resulting need for action and funding (see also Acknowledgements on page 2). Within the respective issue areas, we covered a wide range of actors in our outreach and technical conversations.

For the assessment of financing needs, only those goals that were either unanimously identified in the expert interviews as necessary and priority goals or were clearly politically accepted and not the subject of significant controversy (e.g. the legal right to a place in a day nursery or all-day childcare, which have been repeatedly reaffirmed by successive federal governments) were classified as generally accepted and thus included. Nevertheless, there are bound to be differences of opinion about the funding needs considered in this study. This is another reason why we report our findings at a granular level (in the German original), so that readers can understand our calculations and adapt them to their own preferences.

Determination of minimum needs

On this basis, we have identified the minimum additional public financing required to meet the common objectives identified through the process outlined above. In cases where there is a wide range of estimates of funding requirements, we have used the minimum requirements considered plausible by experts. Our estimates are therefore cautious and conservative overall.

3 In determining the relevant targets, we primarily focus on objectives that are agreed or discussed at the federal level, meaning that coverage at the state and municipal levels may be less complete.

4 The areas added were research, internal security and further aspects of external security.

Where possible, we have relied on existing studies and publications.[5] In cases where there were no generally accepted studies or publications, we have carried out our own bottom-up calculations, particularly for the defence sector. To our knowledge, this study is the first to provide a granular and publicly accessible estimate of the military costs of these changing times based on a clear capability profile for the Bundeswehr (armed forces).

In instances where neither recognised studies nor a bottom-up calculation were available or feasible, we have employed our own top-down estimates. This approach was taken, for instance, to assess financing needs for measures in the realm of diplomacy and development cooperation within an expanded concept of security.

Where there were relevant discrepancies between existing studies, we listed the range of data (as available to us) and, in cases of doubt, chose the lowest cost approach unless there were strong substantive reasons not to do so. Where there were such reasons, we explain each decision in the relevant technical sections.

We then shared the resulting drafts with subject experts and incorporated the relevant feedback. The subsequent results were also discussed confidentially in a workshop with budget experts from politics and academia. Naturally, the authors are solely responsible for the content and conclusions of this study.

Further comments

The resulting financing needs are presented in nominal terms, with a general inflation assumption of 2% per annum from 2024. The base year for the calculation is 2024. Accordingly, we have adjusted the needs calculated for or in earlier years for inflation up to 2024. As consumer price inflation is not the only relevant factor for our purposes, and to ensure a consistent and comprehensible calculation, we have used the GDP deflator from the German government's 2024 spring forecast (BMWK & BMF 2024). In some cases, this may lead to an underestimation of actual needs, as construction costs in particular have risen faster than the GDP deflator and infrastructure measures play a major role in the identified financing needs.

In areas where the potential of investments cannot otherwise be meaningfully exploited, we report additional operating costs in addition to the relevant investment needs. These include, for example, staffing needs in education and defence. Figure 4 shows the corresponding breakdown of total financing needs. For 28 percent of the needs it is not possible to make a clear allocation, e.g. the financing needs for public transport, which include both investment and operating costs. For this figure, the net financing needs identified in the area of decarbonisation have been broken down according to the relative distribution of expenditure types in the average of the two scenarios examined.

5 The use of existing studies and publications results in turn from our goal of utilising the expertise of the stakeholders in the respective issue areas as comprehensively as possible.

Breakdown of additional financing needs by investment and operating costs

In billions of euros

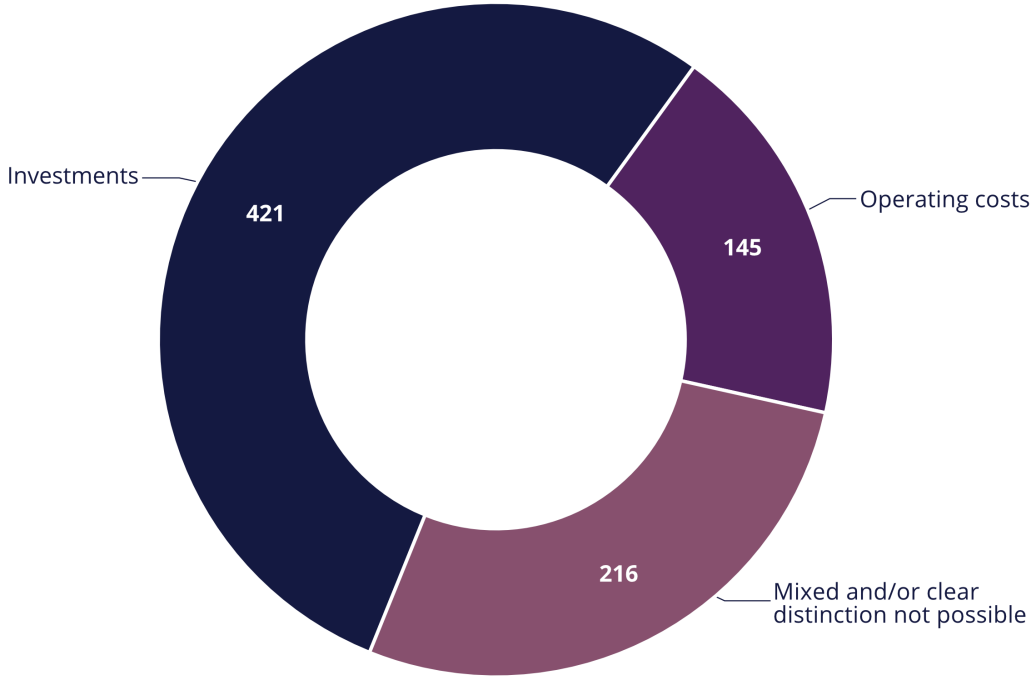

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Figure 4: Breakdown of additional public financing needs by investments and operating costs; **source**: own calculations

Overall, we have taken a cautious approach and sought to avoid making strong political judgements whenever possible. This can be seen, for example, in the fact that in cases of doubt we used the lowest estimates of financing need to achieve a particular goal (see above), took into account obstacles to implementation (e.g. in the case of municipal roads) and only considered goals with broad political support (and therefore did not take semiconductor production into account, for example). In line with this approach, we also assume that existing legal provisions on financing responsibilities will be maintained, so that, for example, the expansion of electricity grids, which is currently financed entirely by the private sector, is not considered (although there are current debates about a greater role for the state in this context).

In certain cases, we address uncertainties by calculating various scenarios, from which we then determine a plausible approach for determining the total additional need.[6]

6 In the case of economic resilience, we use the lower value for financing need to calculate the total amount; in the area of decarbonisation, we use the mean value of the two scenarios considered in order to take into account uncertainties regarding the future development of emission prices.

2. Results at a glance

As shown above, we calculate an additional need for public financing of 782 billion euros for the period up to and including 2030, spread across twelve spending areas. The following is a brief summary of the targets and results considered for each area respectively; a detailed derivation of the results are available in the technical sections of the original German version of this study.

Productivity and public services

Education

A total of at least 127 billion euros in additional public financing will be needed by 2030 to maintain educational infrastructure and expand it in line with legally agreed-upon targets and demographic necessities. The greatest additional needs exist in the area of general education schools: Here, 57.1 billion euros in additional financing are needed to reduce the investment backlog with respect to school buildings, as well as at least 15.6 billion euros to cover the additional teaching staff required to maintain the current student-teacher ratio. In addition, 9.0 billion euros will be required for the further digitisation of schools, as well as 1.9 billion euros in investment and 8.2 billion euros for additional staff to implement the legal entitlement to all-day childcare.

In the elementary sector, we consider the implementation of the legally enshrined entitlement to a nursery spot and the reduction of the existing investment backlog. This will require 16.8 billion euros for the renovation and expansion of infrastructure and a further 13.6 billion euros for additional personnel. In the higher education sector, an additional 5.1 billion euros are needed for the renovation of university buildings.

Decarbonisation

For the decarbonisation of the German economy in line with legally agreed emission reduction targets, we calculate a *total* public financing need for the federal government of around 340 billion euros in the period from 2025 to 2030. This corresponds to around 56.7 billion euros or 1.3 percent of GDP per year. This does not take into account the financing needs of the railway system, which are included in the transport section.

In line with the federal government's current domestic climate financing strategy, we calculate the *additional* public financing need as the difference between the total financing need and the expected revenue from the pricing of greenhouse gas emissions. In our assessment, we distinguish between a scenario with a moderate and a sharp rise in emission prices.[7] We base our estimates of revenues, compensation needs and public subsidy requirements, as far as possible and reasonable, on the development of emissions prices.

The *total* financing need hardly varies in both scenarios, as the lower funding needs and higher compensation requirement roughly balance each other out in the high-price scenario. The *additional* public financing needs for the federal government, on the other hand, differ greatly between the scenarios. In the scenario with a moderate increase in certificate prices, this need is about 207 billion euros, while in the scenario with sharp price rises, it is only 111 billion euros. This corresponds to an additional annual financing need of 0.8 or 0.4 percent of GDP respectively.

We were unable to comprehensively determine the financing needs of the municipalities and states for achieving the climate targets by 2030 within the scope of this study. For selected areas - energy-efficient refurbishment of public buildings, heating networks and natural climate protection - we have made an indicative estimate of the additional financing required. The additional need calculated for the period under

7 In the low-price scenario, the price per ton is 124 euros in the EU ETS and 88 euros in the BEHG/EU ETS-2 in 2030 (nominal). In the high-price scenario, these prices are 225 euros (EU ETS) and 197 euros (BEHG/EU ETS-2).

review amounts to 37.8 billion euros for the municipalities and 10.8 billion euros for the states. The financing needs for local public transport are reported in the transport section.

Overall, this results in an additional public financing need for decarbonisation of 159.6 to 255.6 billion euros across all levels of government between 2025 and 2030. As the political and regulatory conditions for the high-emissions-price scenario to materialise are not currently in place, we use the average of the additional needs from the two price scenarios at the federal level. The total additional financing need for decarbonisation thus amounts to 207.6 billion euros.

Digitisation

After examining the needs for (a) digitisation in individual sectors, (b) digital industrial policy, (c) the expansion of digital network infrastructure and (d) the digitalisation of administration, we do not see any separate additional public financing needs in the area of digitisation. There are additional needs for digitisation in the areas of education and health, but these are dealt with in the respective sections. Additional funding is likely to be required in the area of administrative digitisation; however, due to the lack of data and the high relevance of non-financial obstacles, no additional need could be quantified within the methodological framework of this study. The roll-out of digital network infrastructure is on track, so there is no need for additional funding; the topic of digital industrial policy remains politically controversial and is therefore outside the scope of this study.

Research

In the area of public research and development funding, an additional 9.9 billion euros is required in order to achieve the federal and state governments' target of 3.5 percent of gross domestic product being spent on research and development. The calculation is based on the assumption that the current ratio between public and private research expenditure remains constant and that the average annual growth in research expenditure from 2019 to 2023 continues.

Health

In the area of healthcare, we focus on the hospital sector, as this is where (partial) state funding plays the largest role. Here we examine four targets; for three of these, we identify a need for additional funding totalling 40 billion euros. Implementing a structural hospital reform as currently planned will require 25 billion euros by 2030. Additional financing of at least 8.4 billion euros is needed to reduce part of the existing investment backlog, as well as 7.1 billion euros to implement climate change measures in hospitals. The digitisation of the hospital system has also been taken into account but is not shown as a separate financing need due to possible overlaps with the aforementioned measures.

Transport

At least an additional 166 billion euros will be needed by 2030 to maintain and renew the existing transport infrastructure and to expand services that are becoming increasingly important in light of climate targets. Most of this additional funding is needed for rail infrastructure (62 billion euros) and the need to maintain road infrastructure (65 billion euros, excluding state roads). A further 38 billion euros is required to finance local public transport, which could be significantly higher depending on the assumed expansion and pricing scenario.

Housing

For social housing construction, we calculate a minimum additional need of 30.6 billion euros to achieve the federal policy target of 100,000 new social housing units per year, based on the assumption that the federal financing made available until 2027 and a corresponding co-financing share of 40 percent by the federal states will continue to be made available in the following years until 2030.

Security

Internal security

We have calculated an additional financing need of 22.8 billion euros for internal security. This will strengthen disaster response and civil protection by investing in infrastructure to warn the population, protect the general public with bunkers and similar shelters, build national reserves, digitise crisis management and strengthen relevant authorities and institutions. For security authorities such as the Federal Criminal Police Office, the Federal Police, Customs and the Federal Office for the Protection of the Constitution, a comparison with historical data has shown that an above-average level of funding has already been set for the coming years, even adjusted for purchasing power, so we have not defined any additional financing needs here. However, whether these resources are sufficient for these authorities to make an adequate contribution to internal security would need to be examined separately in the course of an in-depth study.

Adaptation to climate change

There is an additional need for climate adaptation measures totalling at least 38.0 billion euros by 2030. This is the result of a needs assessment conducted by the Conference of State Environment Ministers in 2022, to which the Federal Environment Ministry also refers in the context of the recently adopted Climate Adaptation Act.

Economic resilience

We consider targets and estimate additional financing needs in three areas of economic resilience: in the supply of critical and strategic raw materials; in securing adequate production capacities for energy transition technologies (especially batteries, electrolysers, solar panels, wind turbines and heat pumps); and in strengthening production capacities in the semiconductor sector. In total, these areas will require additional financing of 15.1 to 19.8 billion euros, of which 1.6 to 6.2 billion euros will be for raw materials and 13.5 billion euros for production capacities for energy transition technologies. We have not set any additional financing needs for semiconductors, as significant funding has already been allocated in this area and potential broadly agreed targets beyond those already funded have yet to be identified.

Defence

We estimate the additional costs of securing sufficient German defence capabilities at 103.1 billion euros by 2030. This figure is lower than the 154.3 billion euros we calculated in a first bottom-up estimate of defence needs. Since, for methodological reasons, our bottom-up estimate covers the period up to 2035 and cannot be neatly divided into the years before and after 2030, we use the result of a meso-level estimate based primarily on discussions with practitioners in the administration and their methods. In both cases, the additional financing need is significantly higher than the 52 billion euros that would be necessary to meet NATO's 2 percent target. However, as this target does not correspond to a clearly defined capability profile for the Bundeswehr, the resulting funding requirements are insufficiently justified for our purposes, especially as they are significantly lower than the requirements resulting from our bottom-up analysis up to 2035.

Further aspects of external security

Intelligence services, diplomacy, humanitarian aid, development cooperation and support for strategic partner countries such as Ukraine all make important contributions to Germany's security. As there are many uncertainties in all of these areas and in some cases political disagreements regarding the optimal direction of policy measures, we pursue a conservative top-down approach for assessing the financing needs for these further aspects of external security. This is based on the assumption that, even without defining specific individual meas-

ures or targets, financial resources amounting to at least the purchasing power-adjusted averages of the last three pre-pandemic years will be required. On this basis, we derive an additional financing need of 21.7 billion euros. With respect to Ukraine, we offer a qualitative discussion, but do not quantify additional financing needs due to the unpredictability of further developments in this situation.

Limitations

As explained above, the aim of this study is to determine the minimum requirements for achieving widely accepted targets. In cases of doubt, we have therefore always opted for the lowest-cost approach or excluded potential line items. The total figure is therefore a conservative estimate of additional financing needs and does not claim to be exhaustive.

Politically controversial items such as the various aspects of support for Ukraine in its defensive war, subsidies for domestic semiconductor production, a stronger direct role of the state in energy infrastructure, or further financial aid for housing construction are associated with potentially high additional needs but were not taken into account given the premises of this study. For some of the items included, the available research on which we base our work is limited, such that the corresponding results are only to be understood as initial assessments and that further considerations could possibly identify additional needs. This applies, for example, to the area of internal and extended external security or to climate adaptation measures.

This study also does not take an in-depth look at the needs of municipal extra-budgets and corporations, for example in the operation of water and energy infrastructure. Here, too, there is a high probability of very high additional financing needs, although this is outside the direct scope of this study. The additional financing needs at municipal level are therefore only meaningful for the areas considered and do not indicate a plausible maximum.

3. Overview: Additional financing needs 2025-2030

Area	Additional need (in billions of EUR)		
	Federal	State	Municipal
Education (127.2 billions euros)			
School buildings (reducing investment backlog)			57.1
Teachers (constant student-teacher ratio)		15.5	
School digitisation		9.0	
All-day childcare (investments)			1.9
All-day childcare (personnel)			8.2
Legal daycare entitlements (investments)		8.4	8.4
Legal daycare entitlements (personnel)		6.8	6.8
University buildings (maintenance)		5.1	
Decarbonisation (207.9 billion euros)			
Add. financial need of the federal government*	159.0		
Add. financial need of states and municipalities		10.8	37.8
Research (9.9 billion euros)			
Public R&D funding	5.7	4.2	
Health (40.4 billion euros)			
Structural hospital reform	12.5	12.5	
Closure of investment gaps		8.4	
Climate change measures in hospitals		7.1	
Transport (165.5 billion euros)			
Rail	62.0		
Road infrastructure (maintenance)	13.5		51.8
Public transport		38.2	
Housing (30.6 billion euros)			
Social housing construction	21.9	8.7	
Internal security (22.8 billion euros)			
Civil protection and disaster response	2.3	3.0	17.5
Climate adaptation (38.0 billion euros)			
Climate adaptation measures		9.5	28.5
Resilience (15.1–19.8 billion euros)			
Energy transition technologies	13.5		
Critical raw materials	1.6–6.2		
Defence (103.1 billion euros)			
Bundeswehr (procurement and running costs)	103.1		
Further aspects of external security (21.7 billion euros)			
Diplomacy and humanitarian aid	9.4		
Development cooperation	12.4		

Table 1: Additional public financing needs 2025-2030 by targets and measures, total differences due to rounding effects. *In contrast to the other areas considered, the additional financing need for decarbonisation at the federal level is calculated as the difference between total financing requirements and expected revenue from carbon pricing in two price scenarios. For this reason, the need is shown as a collective item; a detailed breakdown can be found in Chapter II of the original, complete German version of the study. The average value of the two scenarios is included in the general overview.

4. Comparison of the results with other studies

Recently, the Macroeconomic Policy Institute (IMK) and the German Economic Institute (IW) (Dullien et al. 2024, hereinafter also referred to as "IMK and IW" or "IMK/IW") as well as the Federation of German Industries (BDI 2024) also published estimates of public financing needs. The key differences and similarities between the various studies, including our own, are presented below.

The BDI estimates additional public financing needs of 376 to 396 billion euros (BDI 2024), while the IMK and IW estimate an additional need of 596 billion euros (Dullien et al. 2024). At around 782 billion euros, the additional financing needs identified by us are higher than the estimates of the other two studies.

A large part of the differences is due to variations in the scope of the respective studies. In the areas covered by both us and the IMK/IW (2024), the total additional financing needs estimate from us is 569 billion euros, while the total need calculated by IMK and IW is 525 billion euros. In the areas covered by both us and the BDI (2024), our total additional needs amount to 546 billion euros, while the BDI's total additional needs amount to 476 billion euros.

Study / Area	Dezernat Zukunft	BDI	IMK/IW
Education	✓	✓	✓
Decarbonisation	✓	✓	✓
Digitisation	✓		
Research	✓		
Health	✓		
Internal security	✓		
Climate change adaptation	✓		✓
Municipal infrastructure (general)	(Schools, daycare centres, public transport, local roads and infrastructure for fire and disaster response calculated separately)		✓
Economic resilience	✓	✓	
Transport	✓	✓	✓
Defence	✓		
Housing	✓	✓	✓
Further aspects of external security	✓		

Table 2: Comparison of studies on public financing needs by areas covered; **sources**: BDI (2024), Dullien et al. (2024), own calculations

We also take into account the areas of digitisation, research, health, internal security and defence as well as further aspects of external security that are excluded from the BDI and IMK/IW studies. In the fields that are only considered in our study, we have identified an additional financing need of 198 billion euros for health and internal and external security.[8] Table 2 shows the areas considered in each of the studies.

Within the spending areas, some line items from IMK/IW (2024) and BDI (2024) are also outside the scope of our study. In the IMK/IW study, these are requirements for municipal infrastructure beyond investments in municipal roads, daycare centres, school buildings, fire departments and public transport. Based on the KfW Municipal Panel (2023), this amounts to around 58 billion euros.[9]

The BDI study considers individual measures in the areas of transport, decarbonisation, housing and resilience which we do not include. According to the BDI, this results in a total need of 54.3 billion euros (BDI 2024). These individual items are broken down by sector in the following tables. [10]

Further differences emerge from the fact that our study takes into account the funding that has already been allocated, leading to the calculation of actual *additional* needs. Additionally, our study focuses on specific targets that extend beyond the reduction of existing investment backlogs. We identify targets that are broadly accepted across all issue areas, and derive the individual needs on the basis of these targets. In some cases, this approach leads to a broader framework than in the other studies. In the education sector, for example, this means that not only infrastructure but also staffing needs are taken into account. For all items, we show the pure additional financing needs and take into account the financing that is already conceivably available.

The different time horizons of the studies (generally ten years for the BDI and IMK/IW, six years to the end of 2030 in our study) play a subordinate role, as only our study is based on year-specific assumptions about requirements and financing already allocated up to 2030. There is no analogous breakdown in the other two studies. In these studies, in many cases, the requirements listed are purely backlog requirements, which are assumed to be met over ten years. We, in most cases, assume a reduction until the end of 2030. The nominally different time periods therefore have a limited impact on the overall figures. Consequently, we consider the different time horizons to be a minor factor in the following comparison.[11]

In addition, there are some relevant differences in the methodological approach to individual financing needs. For the purposes of classification, we outline here the deviations of our need figures from the BDI and IMK/IW figures in the fields covered by at least one of the other studies. We explain all items in which our figure deviates significantly (> 10 percent) from at least one of the other studies.

8 Based on our methodology, we were unable to identify any additional needs in the area of digitisation (exceptions: digitisation in education and healthcare, which are dealt with separately in the technical sections).

9 This figure is derived from Dullien et al.'s (2024) total for municipal investment of 177.2 billion euros, minus the investment backlog according to the KfW Municipal Panel 2023 in fire services, roads, public transport, nurseries and school buildings, which we also address.

10 The 54.3 billion euros are made up of 18 billion euros for federal waterways and ports, 15 billion euros for charging and refueling infrastructure, 3 billion euros for carbon-neutral fuels and about 18.3 billion euros for housing construction beyond social housing.

11 One exception is the additional funding required for the maintenance of university buildings. Our estimate of funding needs in this area is significantly lower than the estimates in IMK/IW (2024) and BDI (2024) because we assume that the needs are spread out to 2040, in line with the primary source, and only consider six years from this period. In addition to this assumption, our assumption regarding already allocated funds also leads to lower additional needs (see below). We also assume a reduction in the investment backlog in childcare infrastructure by 2035, which we therefore only partially take into account.

Education

Measures \ Study	Dezernat Zukunft	BDI	IMK/IW
Daycare (personnel)	**13.6**	/	/
Daycare (investments)	**16.8**	12 (-)	13.1 (-)
All-day childcare (personnel)	**8.2**	/	/
All-day childcare (investments)	**1.9**	6.7 (+)	6.7 (+)
Teachers	**15.5**	/	/
School buildings	**57.1**	47.4 (=)[12]	52.0 (=)
University building maintenance	**5.1**	34.7 (+)	34.7 (+)
Total	**127.2**	100.8 (-)	106.5 (-)

Table 3: Comparison of education financing needs in billions of euros. Deviations from our study with +/- 10 % tolerance range in brackets; **sources:** BDI (2024), Dullien et al. (2024), own calculations[12]

In contrast to the BDI and IMK/IW studies, our needs estimate for the education sector includes not only investment in infrastructure but also the additional need for staff in daycare, all-day childcare and schools. The consideration of these needs results from the goal-oriented focus of our study, as in addition to the expansion of the infrastructure, the recruitment of qualified staff is of course of crucial importance for the provision of an appropriate quality of services.

For daycare investments, the BDI (2024) and IMK/IW (2024) adopt the requirements identified in Raffer and Scheller (2023).[13] These exclusively quantify the perceived investment backlogs in the existing daycare infrastructure. However, in order to ensure the legal entitlement to a daycare spot, the number of available spots must also be increased. We therefore calculate the investment requirements on the basis of calculations of the additional demand for daycare places (Autor:innengruppe Kinder- und Jugendhilfestatistik 2024) and the average investment need per spot (according to Rauschenbach et al. 2017). We also assume that the investment backlog will be reduced by 2035 in parallel with the expansion of services.

In determining the investment required for the expansion of all-day schools, all three studies rely on the same primary source (Rauschenbach et al. 2021). We subtract the federal funding already available from the needs identified there, resulting in a lower additional need in our study.

For the building infrastructure of universities, the additional financing needs we have determined have the same basis as in IMK/IW (2024), namely a study commissioned by the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder (2023a). The needs identified by the IMK and IW (2024) are also used by the BDI (2024). In accordance with the implementation proposal of the Conference of Education Ministers, we assume that the investments will be realised by 2040. The pro rata consideration of our study up to 2030 and the assumption of a continuation of the previous investment line for construction measures at universities (Destatis 2023a, 2024b) thus leads to a lower estimate of the financing requirement.

12 All need figures are based on the KfW Municipal Panel. Deviations result from the fact that IMK/IW and BDI refer to the Municipal Panel 2023, while we work with the more recent data from the Municipal Panel 2024. The discrepancy between IMK/IW and BDI is due to the lack of inflation adjustment in the BDI study. For these reasons, there are no significant differences in content between the studies.

13 The additional needs shown in the BDI and IMK/IW studies differ only due to the inflation adjustment in Dullien et al. (2024).

Decarbonisation

Measure \ Study	DZ (low emission price)	DZ (high emission price)	DZ (average)	BDI	IMK/IW
Income from emissions trading	-133.2	-231.0	**-182.1**	/	/
Compensation / direct payments	34.8	69.0	**51.9**	/	/
Municipal climate protection management	6.0	6.0	**6.0**	/	/
Renewable energies, adjustable capacities, hydrogen, storage	100.0	86.7	**93.3**	/	/
Decarbonisation of industry	17.4	13.6	**15.5**	26.8	/
Compensation measures (industry)	24.0	31.7	**27.8**	/	/
Building renovation, change in heating systems	119.0	95.2	**107.1**	113.4	/
Heating networks	21.8	22.6	**22.2**	15.4	/
Low-emission vehicles and fuels	4.6	4.6	**4.6**	3.0	/
Charging and refueling infrastructure	7.6	7.6	**7.6**	20.0	/
Agriculture, natural climate protection and nature conservation	5.0	5.0	**5.0**	/	/
Additional need	**207.0**	**111.1**	**159.0**	**65.1***	**200.0**

Table 4: Comparison of total and additional financing needs for decarbonisation measures in billions of euros. *BDI: Additional needs determined after deduction of the KTF (Climate and Transformation Fund) financing allocated for each individual item

The additional financing need of 200 billion euros calculated by IMK/IW is not directly comparable with our estimate, as it includes expenditure on local public transport, which we include in the transport section. Moreover, since the IMK/IW study does not quantify individual items, but only shows the total additional financing need, it is difficult to make an overall comparison.

At 111.1 to 207.0 billion euros, the additional financing need of the federal government that we have calculated is significantly higher than the additional need of 65.1 billion euros estimated by the BDI. While we record the additional financing need in two scenarios as the difference between the overall public financing need and the expected revenue from carbon pricing, the BDI derives the additional need at the line item level as the difference between the financing need and the financing allocated to the Climate and Transformation Fund (KTF). A relevant comparison is therefore only possible at the level of total need per individual item.

The BDI estimates the total funding need for the decarbonisation of industry at 26.8 billion euros. In contrast, we estimate the total funding need at between 13.6 and 17.4 billion euros, which is significantly lower than the BDI estimate. The two studies are close in their estimates of the financing needs for energy-efficient building renovation. The BDI estimates the total annual need at 18.9 billion euros, a total of 113.4 billion euros for the period 2025-2030; our calculations result in a total financing need of 95.2 to 119.0 billion euros.

In the road transport sector, our need estimates are significantly lower than those of the BDI. We estimate a funding need of 4.6 billion euros by 2030 for low-emission vehicles and 7.6 billion euros for charging and refuelling infrastructure. The BDI estimates the public financing requirement for alternative charging infrastructure at 20 billion euros and also sees a requirement of 3 billion euros for the ramp-up of electricity-based fuels.

A final key difference is the treatment of compensation payments. While we estimate the introduction of a compensation or direct repayment amounting to 50 percent of the revenue from the BEHG/EU ETS-2 against the backdrop

of rising carbon prices in both scenarios, this is not taken into account in the BDI breakdown. The resulting difference is around 50 billion euros.

Transport

Measures \ Study	Dezernat Zukunft	BDI	IMK/IW
Federal long-distance roads	**13.5**	13.3 (=)[14]	39 (+)
Municipal roads	**51.8**	/	42.3 (=)[15]
Public transport	**38.2**	64 (+)	28.5 (-)
Train	**62**	63 (=)	59.5 (=)
Federal waterways and ports	**/**	18	/
Total	**167.0**	158.3 (-)	169.3 (-)

Table 5: Comparison of financing needs for transport in billions of euros. Deviations from our study with +/- 10 % tolerance range in brackets; **sources:** BDI (2024), Dullien et al. (2024), own calculations[14] [15]

Our estimate of financing need for federal long-distance roads is largely in line with that of the BDI (2024). The IMK and the IW (2024), on the other hand, calculate a much higher requirement of 39 billion euros over ten years. This is derived from data from the 2016-2030 maintenance requirements forecast (BMDV 2019), from which the authors subtract the financing that has been provided through the federal budget since. Furthermore, their values are adjusted to the current price levels and also take into account expansion measures that we do not include. Instead of the older maintenance requirement forecast, we base our funding estimate on a current requirement report from the Autobahn GmbH (Landmesser 2024). In line with the maintenance requirements forecast, we assume that the financing needs for freeways are roughly double the maintenance needs for federal long-distance roads (BMDV 2019). This results in an additional financing need of 13.5 billion euros until 2030.

For local public transport, our estimate relies on a scenario-based calculation of the annual subsidy requirement on behalf of the Federal Ministry of Transport (Berschin et al. 2023), while both the BDI and IMK/IW refer to a calculation of investment requirements by the German Institute of Urban Affairs (Arndt & Schneider 2023). IMK/IW consider only catch-up and expansion needs, whereas the BDI study considers catch-up and replacement needs (i.e. compared to IMK/IW, no expansion needs but replacement needs).

In contrast to the above-mentioned study, the study on which our assessment is based takes into account the existing financial flows, operating costs and revenues as well as possible implementation restrictions and is used as a reference by both the Federal Ministry of Transport and the Conference of State Transport Ministers. We use this study as it is a more accurate reflection of the real situation, particularly in terms of the significant operating costs. At the same time, it should be noted that this may lead to an underestimation of investment needs. It was not possible to draw on both studies as it was not possible to rule out overlaps between the needs identified in each study, which would have led to the risk of double counting.

14 We combine here the financing need for federal long-distance roads and bridge modernisation which are listed separately in BDI (2024).

15 Both need estimates are based on the KfW Municipal Panel. Deviations result from the fact that IMK/IW refer to the Municipal Panel 2023, while we work with the more up-to-date data from the Municipal Panel 2024. Thus, there are no significant substantive differences between the studies.

Housing

Measures \ Study	Dezernat Zukunft	BDI	IMK/IW
Social housing construction	**30.6**	10 (-)	36.8 (+)
Independent housing construction	**/**	18.3	/
Total	**30.6**	28.3 (=)	36.8 (+)

Table 6: Comparison of financing needs in the housing sector in billions of euro. Deviations from our study with +/- 10 % tolerance range in brackets; **sources:** BDI (2024), Dullien et al. (2024), own calculations

As in the IMK and IW study (2024), our determination of financing need for social housing is based on a study by the Pestel Institute (2022) with the aim of achieving 100,000 new social housing units per year. We adjust the total need determined by the Pestel Institute for inflation and deduct the federal and state financing already earmarked until 2027 (assuming 40% co-financing by the federal states) and continue the funding estimate until 2030. In our perception, IMK and IW calculate the financing need for a shorter period, but without deducting the financing already allocated. The overall lower estimate of financing need results from the assumptions we have made regarding the provision of financing by the federal and state governments.

The BDI's (2024) calculation of financing needs for social housing is based on an extrapolation of the federal financing for the years after 2027 (i.e. the additional need corresponds to the need for a linear extrapolation of the current federal financing). For further residential construction, the BDI also expects existing financing to be maintained and the Climate-Friendly New Construction (KFN) funding programme to be increased due to the high outflow of financing. Due to the controversy surrounding various instruments and objectives in this field, we have not listed a separate additional financing need here.

Adaptation to climate change

Measures \ Study	Dezernat Zukunft	BDI	IMK/IW
Climate change adaptation	**38.0**	/	13.2
Total	**38.0**	/	13.2 (-)

Table 7: Comparison of financing needs for climate adaptation in billions of euros. Deviations from the DZ study with +/- 10 % tolerance range in brackets; **sources:** BDI (2024), Dullien et al. (2024), own calculations

In the area of climate adaptation, Dullien et al. (2024) refer to Raffer and Scheller (2023). Their estimated need of 13.2 billion euros is based on the assumption that planned and necessary investments in the area of climate adaptation are in the same proportion to each other as in the case of climate protection investments. We use the calculations of the sub-working group on financing need of the Conference of State Environment Ministers (2022) as a benchmark, which the Federal Ministry of Environment also refers to in recent statements on the financing need for the Climate Adaptation Act. We therefore expect an additional financing need of 38.0 billion euros.

Economic resilience

Measures \ Study	Dezernat Zukunft	BDI	IMK/IW
Green technologies	**13.5**	20 bis 40 (collective items) plus 3.6 (for battery funding)	/
Critical raw materials, lower limit	**1.6**		/
Critical raw materials, upper limit	**6.2**		/
Semiconductors/ microelectronics	**Qualitative consideration**		/
Chemicals/Pharmaceuticals	**/**		/
Armaments	**/**		/
Total	**15.1 to 19.8**	23.6 to 43.6 (+)	/

Table 8: Comparison of financing needs for economic resilience in billions of euros. Deviations from the DZ study with +/- 10 % tolerance range in brackets; **sources:** BDI (2024), Dullien et al. (2024), own calculations

With regards to economic resilience, the BDI estimates an additional financing need of 20 to 40 billion euros. This sum is shown as a collective item and is not broken down into individual areas of activity. The derivation is qualitative, mentioning the semiconductor, raw materials, green industry, chemicals/pharmaceuticals and defence sectors. In addition, the study sets aside 3.6 billion euros for battery funding, which is reported under energy transition needs but also contributes to resilience.

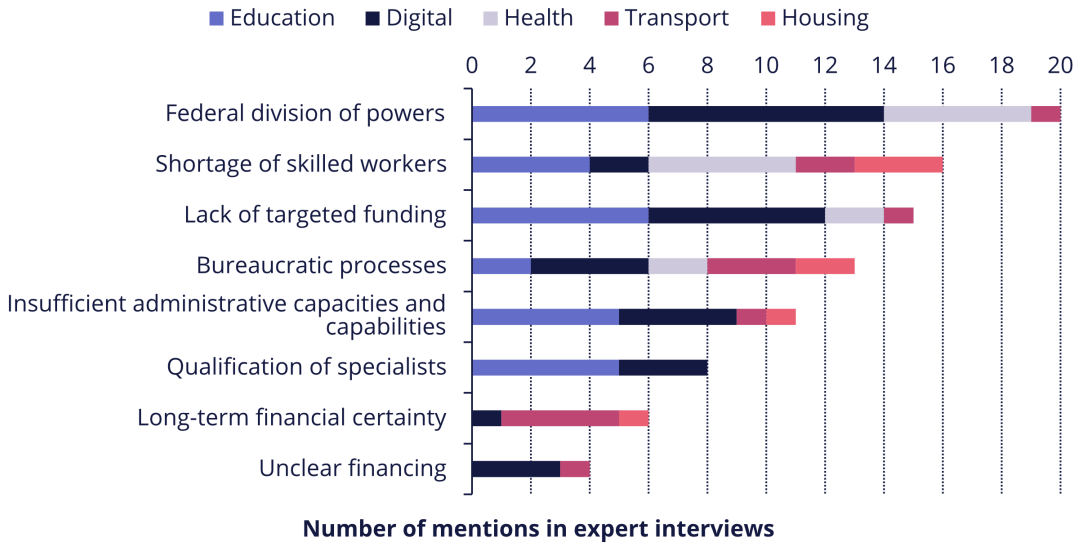
We considered raw materials, green industry and semiconductor manufacturing and identified additional financing needs for the first two. Our derivation is quantitative. We have derived a range for raw materials using our own bottom-up and top-down analyses. For green industries, we have determined public financing needs for Germany on the basis of a detailed total cost estimate (Roland Berger 2023) and its translation into Europe-wide public financing needs (Buck et al. 2023). Based on the KTF's business plan, we have deducted 2.7 billion euros from the latter for battery funding and 600 million euros for the funding of production capacities for energy transition technologies in the 2024 federal budget.

5. Non-financial implementation hurdles

In addition to the problems posed by insufficient funding, non-financial hurdles also make it difficult to achieve the defined goals. An evaluation of the expert discussions we conducted up to April 24, 2024 on the topics of digital policy, education, health, transport and housing provides an approximate illustration of the breadth and relative relevance of these implementation hurdles (see Figure 5). For this purpose, mentions of non-financial implementation hurdles were quantitatively recorded in the expert discussions and summarised according to hurdles and target areas. This evaluation is based on a total of 33 expert discussions. This basis does not allow for a complete or representative analysis of non-financial implementation hurdles but does provide an indication of their relative importance.

Non-financial implementation hurdles by issue area

Qualitative assessment



Qualitative assessment of 33 expert interviews carried out in the area of productivity and public services for illustrative purposes - non-representative.

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Institute for Macrofinance

Figure 5: Non-financial hurdles to implementation by spending area

The implementation hurdles raised in the interviews varied considerably in terms of the frequency with which they were mentioned and their distribution across different areas of expenditure. Overall, the distribution of responsibilities between federal, state and local governments, a lack of skilled workers and a lack of targeted funding were the most frequently mentioned. When broken down by area of expenditure, non-financial barriers are particularly prominent in digital policy and education. Below, we briefly highlight each of the implementation barriers in descending order of importance.

5.1 Overview of hurdles to implementation

- The division of powers between levels of government is a particular obstacle to implementation in the areas of digital policy, education and health. Conflicts of interest between the federal and state governments, for example in the co-financing of investments in the education sector, make it difficult to provide financing and also to use them efficiently. As a result, the implementation of fundamental reform processes is postponed, as illustrated, for example, by the protracted discussions on structural hospital reform.
- A current or impending shortage of skilled workers was discussed as an obstacle to implementation in all spending areas. Across the issue areas, demographic change and the associated decline in the working population are contributing to this problem (Hellwagner et al. 2023). This trend is further reinforced by field-specific drivers: in both the healthcare and education sectors, the current shortage of skilled workers is largely the result of unattractive working conditions and remuneration (Becka et al. 2023; Ständige Wissenschaftliche Kommission der Kultusministerkonferenz 2023; SVR Gesundheit 2024; Weimann-Sandig & Kalicki 2024). In the construction sector, on the other hand, there is a threat of a future shortage of skilled workers, particularly as a result of a reduction in capacity due to the recent slump in contracts (Destatis 2024c).
- A lack of targeting of existing financing poses problems particularly in the fields of digital policy and education. In education, for example, the standard distribution of funds according to the Königstein key means that regions with low tax revenues are underprivileged and that local needs are not comprehensively accounted for. While inadequate targeting sometimes leaves needs unmet, it can also lead to an inefficient use of resources elsewhere. This was mentioned in the expert discussions, e.g. for research funding in the digital sector. The assessment of such misallocations is currently limited to anecdotal impressions, as there has been little collection of relevant data.
- Bureaucratic processes are an obstacle to implementation in the cross-section of the expert discussions on all spending areas considered here. In addition to generally lengthy planning and approval procedures, the challenges mentioned include the overly narrow earmarking of funding, for example in the Digital Pact, and a funding logic that is generally highly conditional (see also Raffer & Scheller 2024). This volume of bureaucracy in turn ties up scarce administrative capacities.
- Insufficient administrative capacities and capabilities lead to long processing times for applications, planning and approval procedures across the various spending areas. The current KfW Municipal Panel confirms these capacity bottlenecks: More than half of the municipalities stated that investment projects were considerably delayed or not carried out at all due to a lack of administrative capacity (Raffer & Scheller 2024). As a result, some of the available funding was not used. With regard to administrative skills, the lack of digital skills was particularly mentioned in the expert discussions.
- Even beyond the administrative level, the needs-oriented qualification of specialists represents a hurdle to implementation. These needs were identified in the expert discussions for digital skills and in the education sector for vocational training and integration.
- Apart from the amount of financing provided, the annuality of the allocation of financing restricts projects due to the lack of long-term funding certainty. This applies, for example,

with respect to the long implementation horizons in the expansion of transport infrastructure or in housing construction. Insufficient short-term flexibility of financing was also mentioned in the digital sphere.

- Particularly in the digital sector, the expert discussions also highlighted the lack of clear financing options. The lack of clarity and bundling of financing opportunities in the spending area creates hurdles in the realisation of projects that are in fact eligible for funding.

This (non-representative) overview of non-financial obstacles to implementation shows that, in addition to the provision of financing, further implementation bottlenecks need to be addressed. For example, the long-term provision of secure funding is an important prerequisite for ensuring sufficient technical and implementation capacities. We have taken these obstacles into account as far as possible in the detailed derivation of the individual requirements: For example, we have not included any additional need for digitisation measures, although these may exist, as significant structural reforms in this area are essential for a targeted use of funding – but their implementation cannot be assumed with sufficient probability.

In other areas, such as infrastructure, it seems plausible that the corresponding non-financial obstacles can be overcome in parallel and partly through the provision of financial resources. The results underline that in order to implement a comprehensive modernisation programme, the focus must not only be on providing sufficient financing, but also on enabling implementation, for example through appropriate financing conditions, but also by strengthening local administrations and implementation capacities.

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