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Unequal Germany

Socioeconomic Disparities
Report 2023

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Unequal Germany:
Socioeconomic Disparities Report 2023

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PREFACE

Germany has had a prosperous decade of record-high employment and stable economic growth. And even today — in light of multiple crises such as a multiyear pandemic, war in Europe and the intensifying climate crisis — the country is doing relatively well. It's true that the economy has shrunk slightly, but economic forecasts for the coming decade are positive and the employment figures remain high. Nevertheless, the majority of Germans believe that social disparities in their country are simply too great. Empirical evidence indeed shows that disparities in Germany have widened. Even orthodox economists have begun to recognise that increasing disparities are a hindrance to sustainable economic growth. Prosperity gains do not trickle down automatically from top to bottom, nor do they alone reduce such disparities. Instead, over the past decade we have witnessed the increasing divergence of income levels despite redistribution measures, as well as a further intensification of wealth concentration. Growing disparities lead to societal polarisation and political apathy. They also aggravate the climate crisis: the wealthiest among us contribute more to climate change while suffering its consequences measurably less. Reducing disparities therefore is economically necessary, as well as politically indispensable, and ecologically sustainable as well as socially just.

Disparities have many facets. Regional disparities, for example, are often overlooked. At the same time, political debates in Germany often divide the country into overly simplified regions assumed to be more or less on an equal footing. In order to understand the phenomenon of disparities more clearly, as well as to make relevant policy recommendations, the Friedrich-Ebert-Stiftung (FES) has published the following socioeconomic disparities report, Unequal Germany, our third edition since 2015. Our previous disparities reports, from 2015 and 2019, already illustrated that not all regions of Germany have benefitted equally from the economic growth of the past decade and that political counteraction was necessary to prevent the country's regions from drifting even further apart. Even though positive developments were observed nationwide, there nevertheless remain massive differences in the general strength and well-being of various regions. Such differences are increasingly significant when considering regional capacities to overcome future challenges resulting from economic and ecological transformations, as well as various crises.

In the disparities report Unequal Germany, the FES attempts for the first time to assess the degree to which Germany's various regions are sustainable and future-proof. Together with the team at the Dortmund-based Research Institute for Regional and Urban Development (ILS), under the leadership of Prof. Dr. Stefan Siedentop, we identified various indicators at the district level that would allow us to assess how well equipped each region is to cope with transformational challenges.

The results show that differences are far more subtle than public debate might suggest. There is, for example, no binary distinction between urban and rural areas, meaning that cities are not universally well positioned nor rural areas universally poor. Furthermore, the popular belief that western Germany is prospering while eastern Germany continues to suffer under comprehensive structural problems is an oversimplification disproven by our study. The good news is that more than half of Germany's population currently lives in regions with great future potential and low levels of crisis-induced insecurity. This is especially true of the country's 'regional innovation stars', economic and scientific centres that are relatively evenly spread around eastern, western and southern Germany. That said, there is a critical mass of regions that will have serious problems coping with transformation without political intervention. Germany's negative demographic development is among the most significant future constraints.

This study puts new weight behind many long-existing demands, such as responsive and well-functioning government at all levels, expansion of public services, as well as needs-based allocation of government funding. Politicians and government policies have a responsibility to prevent increasing socioeconomic and political polarisation.

We hope that the English version of our report will be informative for an international audience, interested in the most pressing issues concerning regional disparities. We therefore thank you for your interest in our report and look forward to continuing the international debate on strategies for overcoming disparities.

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1
PARITY OF LIVING CONDITIONS — STILL UNMET

Development of the social environment has long been a topic of German public debate. The question of where life is better or worse ultimately takes in many aspects of private and public discussion. Regional disparities reflect migration patterns, income levels, life choices and the prosperity of all citizens. But they also raise the issue of the degree of social and spatial inequality that is acceptable in Germany and how this inequality ultimately affects our democracy.

Germany's constitution, the Grundgesetz, assigns us an active role in ensuring parity in living conditions. Both earlier versions of this report — Unequal Germany 2015 (Albrech et al. 2016) and 2019 (Fink et al. 2019) — from the Friedrich-Ebert-Stiftung (FES) testify that this responsibility has not been met by any measure.

SOCIOECONOMIC DISPARITIES REPORTS SINCE 2015

This is the third socioeconomic report published by the FES since 2015. The previous report, from 2019 (Fink et al. 2019), was based on analysis performed by the Dortmund-based Research Institute for Regional and Urban Development (ILS) on current representative indicators from the areas of economics, educational opportunities, life choices, prosperity, health, state action, social participation and internal migration. A cluster analysis[1] of the data yielded the following results (in brief).

Germany can broadly be divided into five, very diverse spatial areas:
- **Germany's solid middle** with 32.8 million residents (39.6 per cent of the entire population) is by far the largest of all groups, primarily with average values on all indicators.
- **Dynamic large and medium-sized cities with elevated risk of exclusion** and their **strong urban hinterland** together form Germany's prosperous regions (36.4 million residents, 44 per cent of the total population), centred primarily in the south, a few points in the west and north, as well as the capital city, Berlin. Beyond positive growth and competition indicators lie hints of disadvantage for lower-income households, a result of rising costs of living and increased risk of poverty (risk of exclusion).

- **Urban regions facing continuous structural change and rural regions in long-term structural crisis** combine to form the areas of Germany with the most problematic development (13.6 million people, 16.4 per cent of the entire population). The causes of these structural problems lie, on one hand, in the loss of significance of certain industrial sectors in the West (such as mining or heavy industry), and on the other hand in the long tail of German reunification in the East's rural regions, where the collapse of various economic activities and labour markets is still deeply felt.

Regional data used in the 2019 analysis measured indicators through 2017, thus showing that the multiyear period of economic growth beginning in 2010 was clearly not enough on its own to reduce regional disparities by any significant extent. The public debate over these and other studies of socio-spatial inequality in Germany ultimately led the government, then led by the grand coalition of Christian Democrats (CDU/CSU) and Social Democrats (SPD), to put parity of living conditions on its policy agenda.

> **Government Commission on Parity of Living Conditions from 2019**
>
> The previous legislature of the German parliament (Bundestag), under the leadership of the grand coalition, claimed to have taken important steps toward parity of living conditions in Germany. It created a government commission which presented its results in July 2019. All executive offices participated in the creation of a package of 12 individual measures. The package addressed issues across the political landscape: from debt relief for local governments to improvements in federal assistance measures, from infrastructure expansion to promotion of cohesion, engagement and voluntary service, even the proposal of a 'parity check' for all federal legislation. In its April 2021 interim report, the federal government listed a variety of individual initiatives currently in progress. At that time, however, they were (still) unable to say how effective any single initiative was or how much it contributed to achieving the goal of parity of living conditions in Germany.

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[1] For an explanation of the methodology, please see Appendix B.

Now, four years later and again at the behest of the FES, the ILS has undertaken another up-to-date analysis of socio-spatial inequality.

We wanted to know whether this past decade's consistent economic growth, as well as government interventions had been able to reduce socio-spatial inequality in Germany. Our current data goes up to 2022 only in part, meaning that the major exogenous shocks of the start of this decade (Covid-19 crisis, invasion of Ukraine, the resulting energy crisis and inflation) could not be analysed in full.

NEW: AN EXPANDED AREA OF ANALYSIS

There is increasing interest in understanding how 'future-proof' various regions of Germany are. As crises seem to pile up and the transformation to a climate-neutral economy becomes ever more urgent, the question of regional resilience demands discussion. We know that every region will be required to achieve climate neutrality by 2045, but they by no means face an equal challenge. Which regions will be most affected and are they adequately endowed to cope with the task? This study develops a number of indicators that can address the sustainability of various geographic areas and identifies the regions facing the largest hurdles along the road to successful transformation. This information allows us to develop conclusions that could promote future-oriented structural and industrial policy that is not blind to regional differences during this significant decade of transformation.

This study, like those before it, goes beyond a mere baseline survey to provide policy recommendations. These recommendations take into account that, on one hand, many past political promises at the state and federal level have remained unfulfilled, including financial relief for overburdened local governments or a measurable improvement in general public services, both of which are essential to the perception of parity of living conditions nationwide.

At the same time, our recommendations also take into account that the decade to date has been afflicted by numerous crises and transformational challenges. This means, first, that financial capacities are decreasing and existing resources must (and can) be used in measurably more efficient ways to achieve socio-spatial parity. Second, we must consider the often discussed cultural differences between prosperous, largely urban areas and their rural counterparts. One policy lever here is to ensure more opportunities for citizens to participate in the socioeconomic development of their locality or region. Increased participation may help to turn the affected parties into makers and doers, thereby generating more avenues for influence, developing competencies and confidence — in short, organising power locally to shape a common future.

2
GERMANY TODAY: MINOR CONVER-GENCE OF LIVING CONDITIONS

2.1 CLUSTER ANALYSIS[2]

Germany is a wealthy country, but this wealth is not shared equally on an individual or regional level. A variety of indicators and measures are useful when analysing wealth gaps and regional differences in living conditions. In order to proceed systematically and analyse the variety of regional measures available, the ILS at the behest of the FES performed a cluster analysis of selected indicators. This set of indicators was based upon those in the previous FES studies from 2015 and 2019. These indicators were collected for all 400 municipalities and districts in Germany. The time range spans between 2019 and 2022, limited only by data availability. Individual municipalities and districts were sorted into one of five categories (clusters) with similar value characteristics. Table 1 provides an in-depth description of the individual indicators and their significance.

Figure 1 shows the result of this cluster analysis in a disparity map. For interpretation, the individual spatial areas were given appropriate names and characterised with an explanatory description in Table 2.

Limited comparability between the FES Disparities Reports from 2019 and 2023

Despite relying largely on the same indicators, the FES Disparities Reports from 2019 and 2023 cannot be compared with one another directly. The reason lies in a divergence of definitions and calculation methods for specific indicators, as well as methodological specificities that prevent the direct comparison of cluster analyses over time. The cluster sorting process is based on the entire data set for each year, either 2019 or 2023. As regional developments take place over a long period of time, the resulting models often appear similar when repeating the analysis with current data, but each analysis must be viewed and interpreted independently. Therefore, the placement of a district in a different socio-spatial cluster on a 2023 map than on a 2019 map should not be viewed as either an improvement or a decline.

In order to illustrate development over the past five years, Table 3 presents the tendencies of the mean values for specific indicators in each cluster with directional arrows.

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2 This section is based on calculations by the Research Institute for Regional and Urban Development (ILS) in Dortmund. For further background information on the individual indicators and topic areas, as well as methodological notes, please see Appendices A, B, and C, as well as Heider et al. (2023).
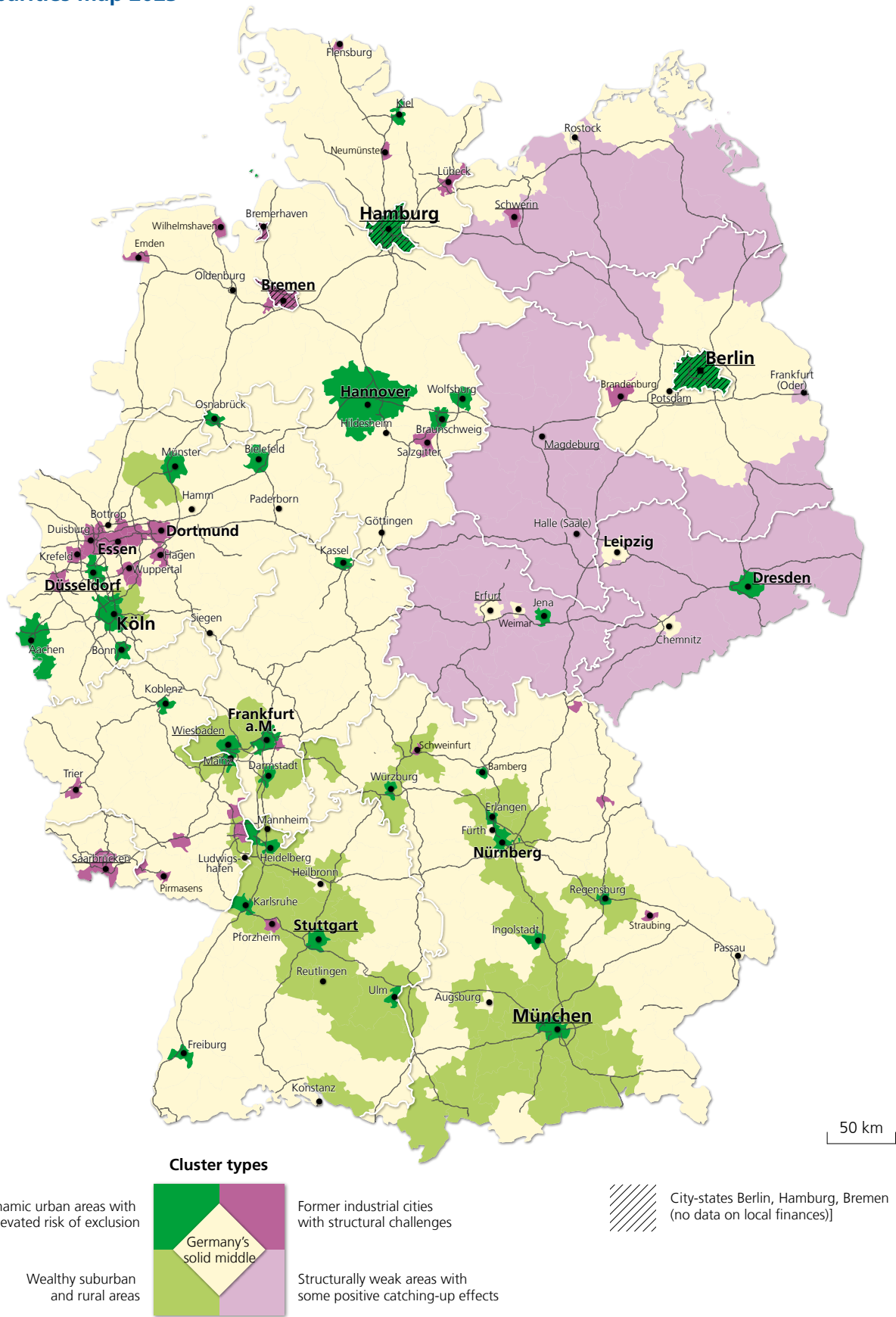
TABLE 1

Indicators of disparities in Germany

1. Economy, employment and labour market	
Highly qualified workers (%)	The percentage of regular employees[3] (by residence) with a university degree measures the knowledge orientation of a regional labour market. A higher percentage of highly qualified workers typically goes hand in hand with higher levels of productivity in a regional economy, higher wages and better advancement prospects for workers, as well as a higher potential for innovation across the entire region.
2. Education and opportunities	
Old-age poverty (%)	The indicator here measures the percentage of welfare recipients of retirement age (currently 67) and above, as well as recipients of long-term disability benefits from age 18. This indicator is likely to be underreported, as many impoverished residents do not apply for benefits despite being eligible out of shame or fear of stigmatisation. This hidden poverty is especially true among the elderly (Friedrichsen/ Schmacker 2019).
Child poverty (%)	Child poverty is not only an enormous burden for children and young people in their everyday lives, but also creates a significant obstacle to their future educational and career success. Educational achievement in Germany remains strongly linked to social status and family background (OECD 2022). This indicator gives the percentage of children under 15 years of age in a household receiving welfare benefits. As in the case of old-age poverty, this measure is also likely to be underreported, as a number of children also live in households in which their parents earn just above the threshold for state benefits (working poor, that is, dual income in precarious, low-wage sectors).
3. Life expectancy and health	
Life expectancy (years)	Inequalities in life expectancy can often be explained by social factors, such as income and educational level, but are also tied to environmental factors and access to health care. The disparities map displays the average life expectancy in years for each region.
Travel time to general practitioners (average drive, in minutes)	In rural and remote areas, the ability to reach and access medical services (doctors, hospitals) is essential to ensuring the timely prevention, diagnosis and treatment of illness. The disparities map shows the average driving time to a GP in minutes.
Gross income (EUR)	The wealth of a region depends primarily on the incomes of its residents and the income opportunities in its labour market. This is measured by median gross income by residence, which in contrast to average gross income cannot be distorted by a few, very high incomes, thus ensuring a result closer to the actual income opportunities of the average resident.
4. State investment, public infrastructure and political participation	
Municipal debt (EUR, per resident)	Local budgets define the level to which local governments can improve living conditions for residents or locational factors, which increase their desirability to business. A high level of indebtedness limits administrative solutions, as well as government investment in infrastructure, thereby affecting the quality of life for local residents. The disparities map thus also includes a measure for municipal debt in euros per resident.
Electoral participation (%, federal parliamentary elections 2021)	One possible result of state inaction is low electoral participation, which can be understood as an expression of a crisis of faith in state action. A number of authors also connect electoral results with perceptions of spatial inequality and life in regions in which people feel 'left behind' (McCann 2020; Rodríguez-Pose 2018). In the disparities map we therefore considered the regional electoral participation rates for the most recent federal parliamentary elections.
Broadband access (%)	Increasing broadband access is a central topic illustrating the connection between government action and the living conditions and participatory possibilities of local communities. Considering the advancement of digitalisation and its impact on employment models, as well as the transition of the work environment towards home office or hybridisation, high speed internet is now a basic necessity for ensuring parity of living conditions. It is illustrated in the disparities map as the percentage of the population with broadband access.
5. Migration	
Net in-migration (per 100,000 residents)	Migration patterns can be understood as a result of the interaction between unequal standards of living and the locational preferences of the population. Transregional migration is in this sense also understood as a kind of 'voting with one's feet' (Siedentop et al. 2020). The disparities map therefore includes net regional in-migration (arrivals minus departures) data for the past five years in relation to original population figures.

3 For the purposes of this report, 'regular employees' denotes all workers subject to social security contributions.

FIGURE 1

Disparities map 2023

Cluster types

Dynamic urban areas with elevated risk of exclusion

Wealthy suburban and rural areas

Germany's solid middle

Former industrial cities with structural challenges

Structurally weak areas with some positive catching-up effects

City-states Berlin, Hamburg, Bremen (no data on local finances)]

50 km

Source: authors. Data source: Regional statistics, Bertelsmann Stiftung: Wegweiser Kommune, Federal Institute for Research on Building, Urban Affairs, and Spatial Development, Thünen Landatlas, Federal Employment Agency statistics, Bundesnetzagentur's Gigabit Grundbuch der Bundesnetzagentur, GeoBasis-DE/BKG 2021

Areas of socioeconomic disparities in Germany

Key: ++ far above average; + above average; o average; - below average; -- far below average; green areas: locational advantages; red areas: locational disadvantages; abbreviations: pop. = population; m = million; hq = highly qualified; y = years; GP = general practitioner; min = minutes; gov. = government; elect. = electoral
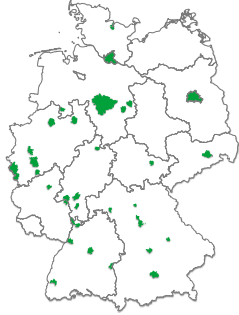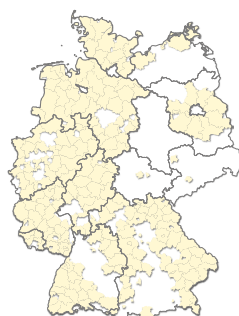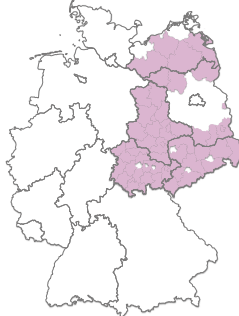
Characterisation	Indicator levels	Spatial dimensions
Dynamic urban areas with elevated risk of exclusion (35 districts, population 17.6 million)		
Very good income opportunities for highly qualified workers, sustainable labour markets, good infrastructure, and the accessibility of essential amenities are the most significant locational advantages of Germany's prosperous economic centres. These include all major metropolitan areas, as well as some smaller but economically strong large- and medium-sized cities. Above average risk of poverty in these urban areas indicates increased social polarisation and risk of exclusion. Since 2015 and even in comparison with the other clusters in this study, these areas have seen the lowest levels of in-migration, a symptom of the increasing shortage of housing in dynamic urban areas. This may also be interpreted as a sign that decreasing numbers of people can afford or choose to live there.	hq employees: ++ (30.7 %) old-age poverty: ++ (5.3 %) child poverty: + (15.9 %) life expectancy: + (81.4 y) GP travel time: - (2.7 min) income: ++ (3,880 EUR) municipal debt: o (1,836 EUR) elect. participation: o (77.1 %) broadband: ++ (97.8 %) in-migration: - (12.9 per 100,000 pop.)	
Wealthy suburban and rural areas (49 districts, population 11 million)		
Germany's wealth is concentrated in the greater metropolitan areas of southern Germany, especially in the states of Bavaria and Baden-Württemberg, as well as a few suburban areas of western Germany's large cities. The monthly median gross income exceeds that of prosperous urban areas. Poverty levels, as well as municipal debt rates are comparatively low. These areas enjoy the highest life expectancy and electoral participation rates nationwide. They also benefit from above average access to broadband, as well as medical services. These areas benefit greatly from their proximity to nearby economic centres, as well as the organic economic structures that have matured around the many large and medium-sized companies headquartered here.	hq. employees: + (18.7 %) old-age poverty: - (1.7 %) child poverty: - (5.4 %) life expectancy: ++ (82.3 y) GP travel time: (4.0 min) income: ++ (3,906 EUR) municipal debt: - (861 EUR) elect. participation: ++ (81.6 %) broadband: + (94.7 %) in-migration: o (447.8 per 100,000 pop.)	
Germany's solid middle (223 districts, population 39.6 million)		
This cluster is defined by its barely discernible divergence from the national average. Only a below average percentage of highly qualified workers hints at the fact that some of these regions may lose their connection to dynamic urban areas and their commuter zones in the future. The distance of many of these peripheral districts from larger urban areas is a potential disadvantage. In contrast, the childhood poverty risk tends to be below average, while relocation is higher than in all other areas. These areas tend to be quite heterogeneous. They are found across large swaths of rural western Germany, in a few eastern German large cities, as well as areas around Berlin which have benefited in the recent past from spillover effects of the capital city.	hq. employees: - (12.8 %) old-age poverty: o (2.4 %) child poverty: - (9.5 %) life expectancy: o (81.0 y) GP travel time:: o (4.8 min) income: o (3,452 EUR) municipal debt: o (1,417 EUR) elect. participation: o (76.9 %) broadband: o (90.1 %) in-migration: + (514.8 per 100,000 pop.)	
Former industrial cities with structural challenges (38 districts, population 6.9 million)		
This spatial area combines the former industrial cities in the Ruhr valley, the states of Saarland and Rhineland Palatinate, and Germany's coastal areas. Indicators such as a well above average poverty risk for children and the elderly, reduced life expectancy, and lower electoral participation rates all point to persistent social problems. As a result of high levels of local indebtedness, local government has a limited ability to tackle these issues. The cities are trapped in a negative cycle of overlapping socioeconomic challenges from which they are unlikely to free themselves independently. The only positive indicators of note are good accessibility of GPs and above average access to broadband.	hq. employees: o (14.0 %) old-age poverty: ++ (5.0 %) child poverty: ++ (23.9 %) life expectancy: -- (79.8 y) GP travel time: - (3.1 min) income: - (3,331 EUR) municipal debt: ++ (4,047 EUR) elect. participation: -- (70.4 %) broadband: + (97.2 %) in-migration: - (333.8 per 100,000 pop.)	

Structurally weak areas with some positive catch-up effects (55 districts, population 8.2 million)

This spatial area comprises the rural areas of eastern Germany. Even though it appears that population loss in rural eastern Germany has been halted, there is still a massive shortage of young, well educated, highly-skilled labour. One significant factor is the lack of lucrative employment opportunities, expressed, among other indicators, by wages that are far below average. Despite their many structural deficits, some regions nevertheless display remarkable catch-up processes. Broadband expansion and positive wage development have experienced the most significant progress (see Table 3). Another strong advantage is the low level of local indebtedness. As a result of the large number of women who earned full pension rights working in the GDR, the level of old-age poverty is (for now) noticeably lower than in all other spatial areas.

hq. employees: - (11.6 %)
old-age poverty: -- (1.0 %)
child poverty: o (11.9 %)
life expectancy: - (80.1 y)
GP travel time: + 5.7 min)
income: -- (2,841 EUR)
municipal debt: - (839 EUR)
elect. participation: - (72.5 %)
broadband: - (86.3 %)
in-migration: -
(−200.5 per 100,000 pop.)
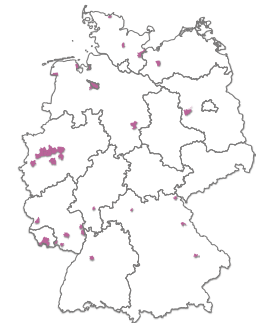
The development of cluster averages over the past five years

Key: ↑ strong growth; ↗ growth; o stagnation; ↘ decline; ↓ strong decline; green tones mark positive developments, red tones negative developments; abbreviations: Hq. = highly qualified; % pts = percentage points; y = years; pop. = resident/s; gov. = government.

Notes: As a result of changes to the calculation of the indicator 'GP travel time', we cannot show its progress over the past five years. The indicators 'electoral participation' and 'broadband access' show progress over four rather than five years as a result of the length of a legislative period or the data available.

Indicator	Time period	Dynamic urban areas with elevated risk of exclusion		Wealthy suburban and rural areas		Germany's solid middle		Former industrial areas with structural challenges		Structurally weak areas with some positive catch-up effects	
Hq. employees (% pts)	2016–2021	+4.8	↑	+3.3	↑	+2.4	↗	+2.4	↗	+0.6	o
Old-age poverty (% pts)	2015–2020	+0.2	o	0	o	−0.1	o	+0.2	o	−0.1	o
Life expectancy (y)	2014–2019	+0.1	o	+0.2	↗	+0.4	↑	+0.4	↑	+0.4	↑
Income (EUR)	2016–2021	+417	↑	+394	↗	+362	↗	+294	↗	+451	↑
Municipal debt (EUR per pop.)	2015–2020	+77	↗	−148	↘	−136	↘	−374	↓	−263	↓
Electoral participation (% pts)	2017–2021	+0.2	o	+0.7	↑	+0.5	o	−0.6	o	+0.6	o
Broadband access (% pts)	2018–2022	+10.0	↗	+29.6	↑	+26.5	↑	+10.9	↗	+40.7	↑
In-migration (per 100,000 population)	2015–2020	+152	o	+290	↗	+466	↑	+449	↑	+428	↑

2.2 BETWEEN DECLINING URBAN DYNAMICS AND IMPROVING RURAL AREAS

One immediate conclusion of our analysis is that the often discussed urban–rural divide — that is, on one side the high earning, well educated, liberally minded and urbane cosmopolitans in their big cities, and on the other the losers of modernisation in their backwaters with poor employment options, worse infrastructure, and rather conservative and authoritarian world views — could not be validated in such simplistic terms by the data in our analysis. Such generalisations serve neither the political debate nor proposals for government intervention. Socioeconomic development has been much more differentiated, showing improvements in a number of regions, most of them in fact rural. We expand on this below.

Overburdened: economically dynamic urban areas with social problems

These are the economic powerhouses of the nation: cities in the south and southwest, with outliers in the north (Hamburg, Hanover), west (along the Rhine), and east (Berlin, Dresden and Jena). Some 17.6 million residents (21.15 per cent of the population as a whole) live in the cluster of 'dynamic urban areas with increased risk of exclusion', regions marked by their good wage-earning potential as a result of higher-than-average worker qualifications, sustainable labour markets, good infrastructure and excellent connectivity. At the same time, these regions have an above average poverty risk and are showing a decrease in urban in-migration. These indicators point to the overloaded capacities of large cities as a result of social polarisation and growing housing shortages and illustrate that many people can no longer afford to live in such urban environments.

Benefitting from city flight: wealthy suburban areas and the rural middle

Wealthy suburban areas have gained the most as a result of overburdened large cities. The largest such region comprises the greater metropolitan areas of southern Germany, totalling 11 million residents. This spatial area has gross incomes exceeding those of dynamic cities, lower levels of poverty and municipal debt, and the highest life expectancy and electoral participation rates in the country.

Regions belonging to the solid middle experienced the highest level of growth as a result of relocation, with 39.6 million residents (47.5 per cent of the population) now calling them home. This spatial area comprises 223 districts across Germany, including the east, and is marked, besides its high population growth, by low levels of poverty, by and large stable socioeconomic factors, and good life expectancy and broadband access.

Successfully catching up: structurally weak rural areas

The spatial area 'structurally weak areas with some positive catch-up effects' comprises 55 overwhelmingly rural districts in the former East that are home to 8.2 million residents (9.9 per cent of the population). These structural weaknesses continue as a direct result of the economic collapse following reunification, which led to the relocation of many of their best educated residents. At the same time, there are positive indicators: median gross income grew fastest here of any spatial area, municipal debt is comparatively low, broadband access continues to improve, and relocation numbers have decreased.

Land of inequality: the East, divided

Almost half of the 16.1 million residents of eastern Germany (the former East Germany, including Berlin) today live in 'dynamic urban areas' (Berlin, Dresden, Jena) or regions comprising the 'solid middle' (suburban Berlin, Erfurt region, Leipzig, Chemnitz, Weimar, Rostock, parts of Mecklenburg-Western Pomerania). The analysis thus concludes that growth centres in the east are also expanding into their surrounding areas. The east is therefore socioeconomically divided. One can no longer speak of general structural weakness in the east. In order to exploit and perpetuate the potential of these new eastern growth centres, politicians must pay special attention to the worrisome demographic declines in these regions.

Facing structural change: industrial urban areas

Urban areas suffering from the decline of formerly significant industries (mining, heavy industry, textiles) are not a new phenomenon in the western part of the country, with the Ruhr valley, Saarland, and cities across Rhineland-Palatinate and northern Germany most heavily affected. These 'former industrial areas with structural challenges' are home to 6.9 million residents (8.3 per cent of the German population) and are marked by high levels of poverty and municipal debt, as well as lower life expectancy and electoral participation rates. A relief strategy for these cities is long overdue, as it is nearly impossible to escape a debt spiral caused by high unemployment, high poverty levels, municipal debt, and the resulting inability to finance necessary local investment.

This status quo analysis of Germany's socio-spatial living conditions illustrates not just the well-known regional structural inequalities but also some positive developments toward the goal of parity in living conditions. These positive developments are occurring largely in rural regions across the country, which can absolutely be considered winners across all areas.

Unfortunately, the currently available regional statistical data could not completely capture the effects of the most recent crises (consequences of the Covid-19 pandemic, invasion of Ukraine, energy crisis and so on). Thus, in large part the trends measured by our analysis are the result of years of strong economic growth in the second half of the previous decade.

2.3 REGIONAL DISPARITIES IN WEALTH AND PROSPERITY INHIBIT CATCH-UP EFFECTS

Wealth and poverty are still spread so unevenly across Germany that even partial gains in parity could not improve this fundamental inequality.

Socioeconomic inequalities exist not only between the various regional types previously mentioned, but also within single districts or urban municipalities. This is especially true within dynamic large cities, as the preferred living areas are increasingly reserved for the highest earning social classes, while poorer people concentrate in districts with neglected infrastructure and housing stock. The risk of poverty rises most critically where low-earning households face high costs of living. Prices in the rental housing market are one of the most pernicious problems: the higher the rents climb in a given area, the stronger the risk of exclusion for low-earning households.

Looking at factors such as old-age and child poverty, median gross income and the cost of rental housing as a percentage of income, we undertook a systematic analysis of the distribution of wealth and poverty across Germany. Figure 2 shows regional median gross income levels by residence, ranging from well below average (blue) to well above average (orange). A high median gross income level, however, does not automatically correspond to lower risk of poverty in that region, as Table 4 shows.

- The 'wealthiest' areas comprise the accessible rural areas of southern Germany and the suburban or greater metropolitan areas around western Germany's largest cities (orange areas of the map, see Figure 2). The above average rent-to-income ratios stand out here, a sign that these areas are reserved for high income earners or primarily home owners.

- Incomes in the economically strong urban areas of western Germany are minimally lower (light orange), with rent-to-income ratios remaining just as high. This shows quite clearly the effect of such conditions: high levels of old-age and child poverty which hint at high risks of exclusion.
- The next regions have generally average incomes (light yellow) and overlap significantly with Germany's solid middle (see Figure 1).
- Next come the western industrial urban areas in decline (light blue), which have lower average incomes than the rest of western Germany and a higher risk of poverty despite low rent-to-income ratios.
- The lowest average incomes are found in the largely rural areas of eastern Germany (blue). As a result of the lowest rent-to-income ratios nationwide, they maintain low levels of old-age poverty and average risk of child poverty. The low levels of old-age poverty can be explained in large part by the relatively high pensions across the east, especially for women, who were more likely to be employed in the GDR than their cohort in West Germany.[4]

We can see that regional distributions of wealth and poverty in Germany do not break down exclusively along lines of income opportunities. Where wages are the highest, the costs of living and explicitly housing costs are also the highest.[5] At the same time, independent of median income levels, the risk of poverty tends to concentrate primarily in large urban areas.

Looking back at the disparities map, we can see that the economic boom of the past few years has had a negative effect on risk of exclusion in large urban areas and absolutely no sustainable impact on poverty alleviation in structurally weaker regions.

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4 The high unemployment levels and strongly below average wages in large areas of eastern Germany witnessed over the past few decades point to a near-future in which poverty among the elderly will rise drastically as the eldest of these affected groups reach retirement age (for additional information, see Heider et al. 2023).

5 It is important to note here that the percentage of income left after rental costs have been deducted remains higher in economically strong areas than in economically weak areas.

Wealth and poverty in Germany

Average values of spatial areas. Key: ++ far above average; + above average; o average;
- below average; -- far below average; in green: locational advantages; in red: locational disadvantages.

	Child poverty (%)		Old-age poverty (%)		Median gross income by residence (EUR)		Rent to income ratio (%)	
Cluster 1	6.6	-	1.9	-	3,809	+	22.6	+
Cluster 2	16.9	+	5.8	++	3,748	+	23.1	+
Cluster 3	10.2	o	2.5	o	3,400	o	20.4	o
Cluster 4	27.1	++	5.3	++	3,366	o	18.6	-
Cluster 5	12.0	o	1.0	--	2,850	--	16.5	--

Wealth and poverty in Germany

The five spatial areas represent differences in wealth and poverty across Germany and are based upon four indicators: child poverty, old-age poverty, average monthly salary by residence, and average rental costs. The order of the spatial areas as illustrated in the key is based on average monthly salary as the main indicator of regional wealth.

Wealth in Germany

above average ←average→ below average
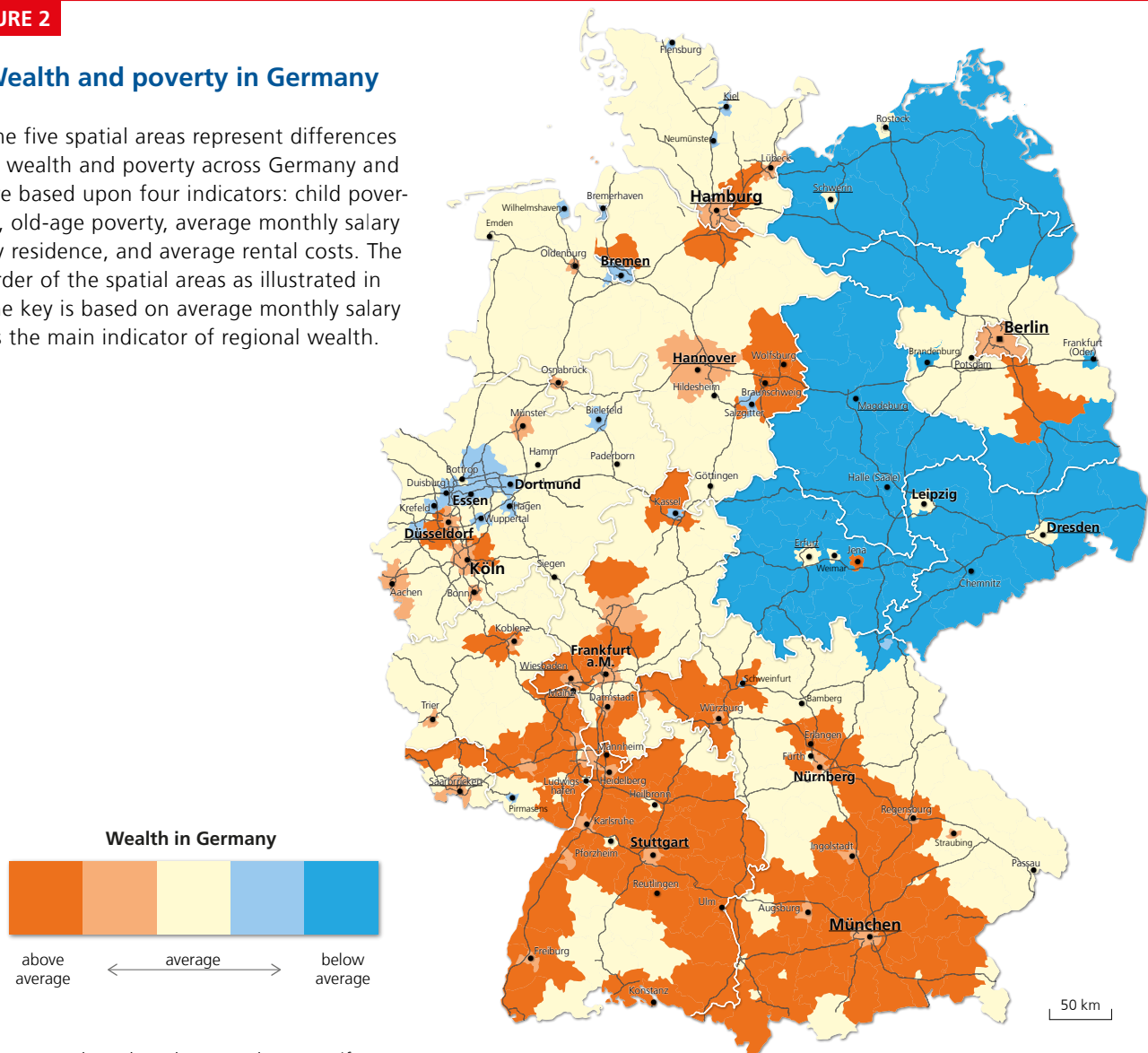
Source: Authors, based on Bertelsmann Stiftung:
Federal Employment Agency statistics, regional statistics, Empirica, GeoBasis-DE/BKG 2021

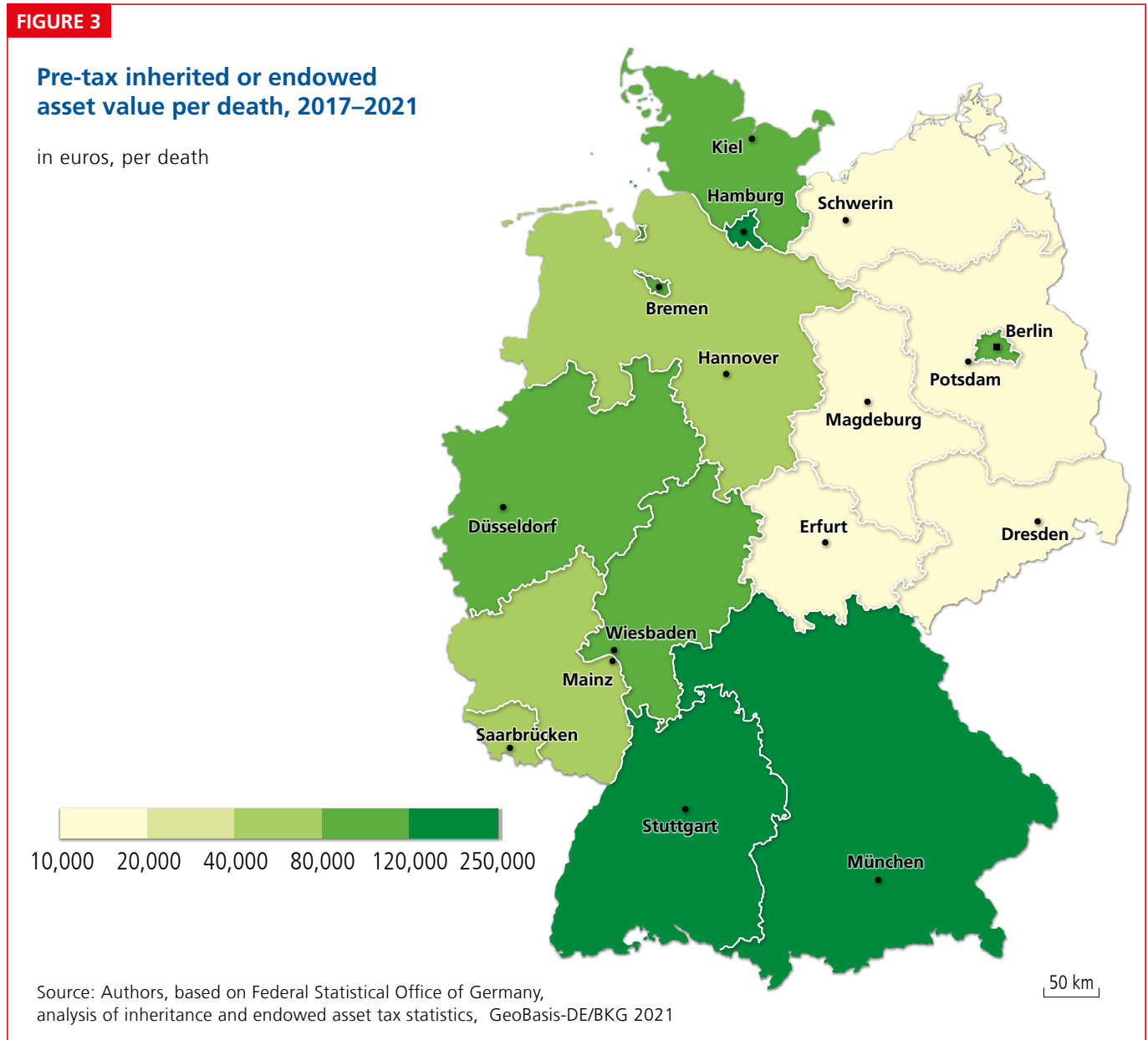Regional differences in asset levels are at least as relevant to regional sustainability as income-based measures. Today's wealth assets will generate more income in the future. Furthermore, adequate levels of wealth can compensate for temporary or partial income deficits, which provides security and increases resilience. Economic areas with higher transfers of wealth from one generation to the next will on average be better positioned in the future compared with regions that have lower levels of inheritance or endowment.

Figure 3 captures a snapshot of the geographical division of assets in Germany.[6]

The results are unsurprising. The differences in the amount of wealth transferred are enormous, especially between the eastern (excluding Berlin) and southern German states, as well as Hamburg.

This extremely uneven distribution of wealth transfers is cause for concern, as it can only amplify existing individual and regional disparities in wealth, poverty and public services across Germany. They represent a massive problem when it comes to achieving parity of living conditions in the country. The catch-up effects of the past few years are impeded by the uneven distribution of income and poverty, and the unequal distribution of wealth will constrain attempts to bring the different regions closer towards parity.

FIGURE 3

Pre-tax inherited or endowed asset value per death, 2017–2021

in euros, per death

10,000   20,000   40,000   80,000   120,000   250,000

Source: Authors, based on Federal Statistical Office of Germany, analysis of inheritance and endowed asset tax statistics, GeoBasis-DE/BKG 2021

50 km

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6 The ILS calculations are based on inheritance and endowed asset tax statistics, which are available only at the state level and not for all 400 municipalities and districts individually.

3
GERMANY IN THE FUTURE

3.1 REGIONAL RESILIENCE AND SUSTAINABILITY

Germany's economic development has always been plagued by crisis: the coal and steel crises in the Ruhr valley and Saarland; the oil crisis beginning in 1973; and massive unemployment around the turn of the millennium, to name but a few. The current concentration of multiple crises, refugee migration, the Covid-19 pandemic, the invasion of Ukraine, inflation and ongoing climate change have exacerbated a sense among residents across all regions of insecurity and fear of loss. Rather than enjoying the promise of a prosperous future, many today fear what the future may bring in the wake of what they are already suffering in their material and cultural lives.

For this reason, both researchers and politicians are increasingly discussing economic resilience. In this context, steps toward economic resilience include making cities more climate-proof, diversifying delivery chains, reducing economic dependencies globally, promoting climate-neutral industrial redesign, and strengthening health care systems. Beyond a new, robust promise of a brighter future and a plausible model for progress, such steps are intended to 'future-proof' economic and social systems by making them more resilient to negative external effects.

Applied to the goal of parity of living conditions, we must ask how the various areas we've identified stand with regard to resilience. 'Regional resilience' is understood here as a regional system's ability to overcome transregional, external shocks and transformational challenges without long-term negative consequences or resulting disadvantage compared with other regions.

3.2 INDICATORS OF FUTURE-ORIENTED STRUCTURAL POLICY

A proactive, forward-thinking structural policy that intervenes early is required to protect regions from such external shocks. This type of proactive structural policy needs reliable indicators that objectively reflect and evaluate the potential of any region to overcome future external shocks and transformational challenges. Our evaluation focuses on three thematic areas:

- How sustainable are the economy, labour market and employees in a given region?
- What future educational opportunities or life paths are available to residents?
- Do regional institutions possess the capacity to act and the infrastructure to do so?

Together with the FES, the ILS has developed an indicator set for each of the above questions (cf. Table 5 and Appendices B and C).

This indicator set was used to perform a cluster analysis on regional resilience and sustainability. This resulted in a resilience and sustainability map using four clusters rather than five as in the earlier sections of the report. Our researchers chose this methodology, as the validity of the analysis was higher with fewer clusters (cf. Appendix B). Figure 4 shows the geographical boundaries of our cluster analysis.[7]

The spatial areas shown in the disparities map are described fully in Table 6.

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7 As in Figure 1, Figure 4 shows the city-states of Hamburg, Bremen, and Berlin with diagonal shading to note the lack of data on local investments in material assets. Furthermore, certain districts and metropolitan areas are given horizontal shading to denote the incredibly high level of energy produced by renewables. Given their relatively unique position with regard to renewables, these exceptional regions are largely considered outliers by the ILS.

TABLE 5

Indicators of forward-thinking structural policy

1. Economy, employment and labour market	
Herfindahl-Hirschman Index (HHI)	One important aspect of research on economic resilience is the diversity of regional labour markets and industrial sectoral structures. Diverse economic structures lower a region's dependency on any one industry or sector, lowering its susceptibility to global crises (Vöpel/Wolf 2018). At the same time, an economy's diversity influences the strength and potential of its innovation, because knowledge may spread beyond any one industry or sector, promoting new ideas, technologies and products (Frenken et al. 2007). The Herfindahl-Hirschman Index (HHI) is the established research method for measuring an economy's diversity (Farhauer/Kröll 2009). This method describes the concentration of individual corporations, industries, sectors or employment fields within a regional economy: the higher the HHI, the higher the percentage of all workers working in a limited number of fields, and therefore the higher the regional economy's dependency on these sectors. It is important to consider when interpreting the HHI that regional economic concentration is not exclusively a negative factor. A certain critical mass of corporations and employees in individual sectors are needed in order to build regional sectoral networks, to benefit from efficiencies of scale, and thus to generate economic growth. On the regional resilience and sustainability map, the HHI has been calculated on the basis of Federal Employment Agency vocational classifications.
Patents (per 100,000 regular employees)	Knowledge intensity plays an important role in regional resilience and sustainability. Employment requiring intensive (scientific) knowledge is not only generally more lucrative, but also considered more future- and crisis-proof than jobs with lower qualifications, as the former are more difficult to replace with digital technologies as digitalisation takes its course (Dengler/Matthes 2018). The knowledge intensity of a regional economy also defines its potential for innovation. Such innovations take place through the exchange of knowledge inside business networks and innovation systems, which often have a strong regional character (Heidenreich/Mattes 2018). Therefore, we include the number of patents filed per 100,000 regular employees as an indicator to measure the strength of regional innovation.
New businesses (net per 1,000 businesses)	Besides innovation strength, the willingness to start a new business, measured as the net number of businesses opened and closed per 1,000 businesses, is an important indicator of future regional economic potential. A dynamic business environment with a large number of new businesses points to a vital and resilient economy, as start-ups also play a significant role in the implementation of innovations and new technologies (Röhl/Heuer 2021).
Ratio of younger (< 30 y) to older employees (> 50 y)	Demographic change is a massive threat to the sustainability of regional labour markets. Over the coming years and decades, the number of working-age people in Germany will decline dramatically, as many older workers retire from the labour market (Heckel 2017) and smaller generational cohorts of young people replace them. The upshot is a shortage of qualified workers, a state of affairs that indeed has already arrived, although it varies greatly depending on region (Habekuß 2017). In order to make these differences in the sustainability of regional labour markets more visible, we have included the ratio of younger employees (under 30) to older employees (over 50) in the map of resilience and sustainability.
Employees in knowledge-based jobs (%)	Not only the diversity of a region's economy, but also its knowledge intensity plays an important role in future resilience and sustainability. Employment requiring intensive (scientific) knowledge is not only generally more lucrative, but is also considered more future-and crisis-proof than jobs with lower qualifications, as the former are more difficult to replace with digital technologies as digitalisation takes its course (Dengler/Matthes 2018). The knowledge intensity of a regional economy also defines its potential for innovation. The number of employees in knowledge-based jobs is included in the map as a percentage of all regular employees.
2. Education and opportunities	
Percentage of highly qualified foreign labour (%)	Because of low birth rates and the stagnation of natural population growth, migration to Germany from other countries has become the most significant factor in population growth there. This migration, however, is spread quite unevenly, spatially (Heider et al. 2020). In this respect it is becoming increasingly important for a wide variety of municipalities and districts to become more attractive to migrants, especially highly qualified ones, in order to meet the labour needs of their regional economies. This is a particularly substantial challenge for rural areas in which there are no established networks or pipelines for migrants (BBSR 2014). We have used the number of foreign employees with a university degree as a percentage of all regular employees with a university degree as the indicator of regional attractiveness to highly qualified migrant labour in the resilience and sustainability map.
Number of young children in preschool (< 3 years, %)	The expansion of childcare for preschool children is an important element in full activation of regional skilled labour potential and the creation of labour market equal opportunities. It not only expands the employment possibilities for young parents and especially women, but also increases the educational opportunities of children from disadvantaged backgrounds (Fuchs-Rechlin/Bergmann 2014). An expansive early-childhood care and education infrastructure is therefore an important factor in parity of future opportunities across all regions of Germany. In order to give weight to this factor, the resilience and sustainability map includes the percentage of children under three years of age in preschool.

TABLE 5

3. Public infrastructure and state action	
Local investment in material assets (per resident, EUR)	State investment in infrastructure is a basic prerequisite for overcoming future challenges. Local governments and their entities make up a large proportion of such investments, the size of which is nevertheless quite dependent on a given municipality's financial latitude. This latitude can vary greatly in its spatial dimensions. In order to evaluate regional investment activity, we have included the local investment in material assets per resident in the resilience and sustainability map. When it comes to interpretation, it is important to consider that the amount of local investment can be oriented not only towards the current population, but also towards expectations of future population growth or decline. Such large spatial differences in investment can thus be partially explained (Altemeyer-Bartscher et al. 2017).
Percentage of households with fibre optic cable access (%)	One example of state infrastructure investment is expansion of fibre optic cable access. Compared with broadband infrastructure, the spatial differences are once again much larger. As workers transition to home office arrangements, good fibre optic cable infrastructure is an important future-oriented resource for many rural areas as a means of attracting (potential) residents and businesses. In the regional resilience and sustainability map, we therefore include the percentage of households with fibre optic cable access.
Maximum regional output of renewable energy (kW/km²)	Some municipalities and districts have assumed an essential role in the production of renewable energy, as they represent a disproportionate amount of water, wind, solar or other renewable energy produced in the country. These regions could profit greatly in the future from their trailblazer status, as the production of renewable energy is a significant factor in economic growth and lucrative employment opportunities. If current discussions on decentralising and localising coordination and price mechanisms for energy production become reality, such areas with highly advanced renewable energy capacities would benefit from lower energy prices, further increasing their competitiveness. The resilience and sustainability map thus includes a measure of the maximum regional output of renewable energy per square km.
Passenger rail accessibility	In the transition to sustainable mobility, passenger rail services play an especially important role. The significant transfer of individual travel from road to rail is required if Germany is to reach its climate goals (Umweltbundesamt 2023). The conditions for this transition, however, are regionally quite heterogenous. Both historical differences in railway construction plans and the removal of railway lines and connections in the past few decades mean that certain cities and regions are more poorly connected to rail travel than others. Thus a good railway connection can also be a positive factor in the economic development of disadvantaged regions (BBSR 2022). In order to measure the spatial disparities in passenger rail accessibility, the ILS developed a passenger rail accessibility index (included in the map). This index considers not only the average distance that residents need to travel to reach the closest passenger railway station, but also the frequency of scheduled local and long-distance services at each station.

TABLE 6

Spatial areas of regional resilience and sustainability in Germany

Key: ++ far above average; + above average; o average; - below average; -- far below average; green areas: locational advantages; red areas: locational disadvantages; abbreviations: pop. = population; m = million; econ. = economic; bd. = based; (reg.) empl. = (regular) employees; investm. = investment; res. = resident; ac. = access; kW = kilowatt; km² = square kilometer

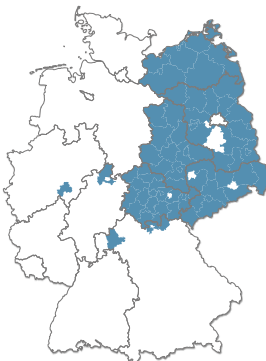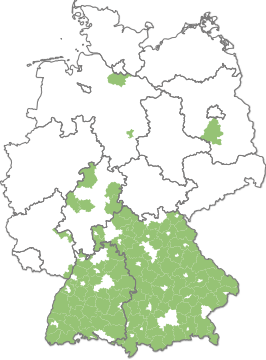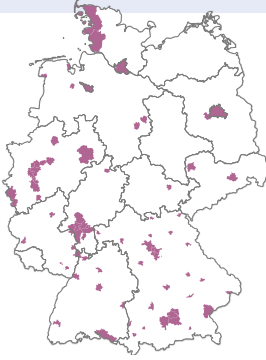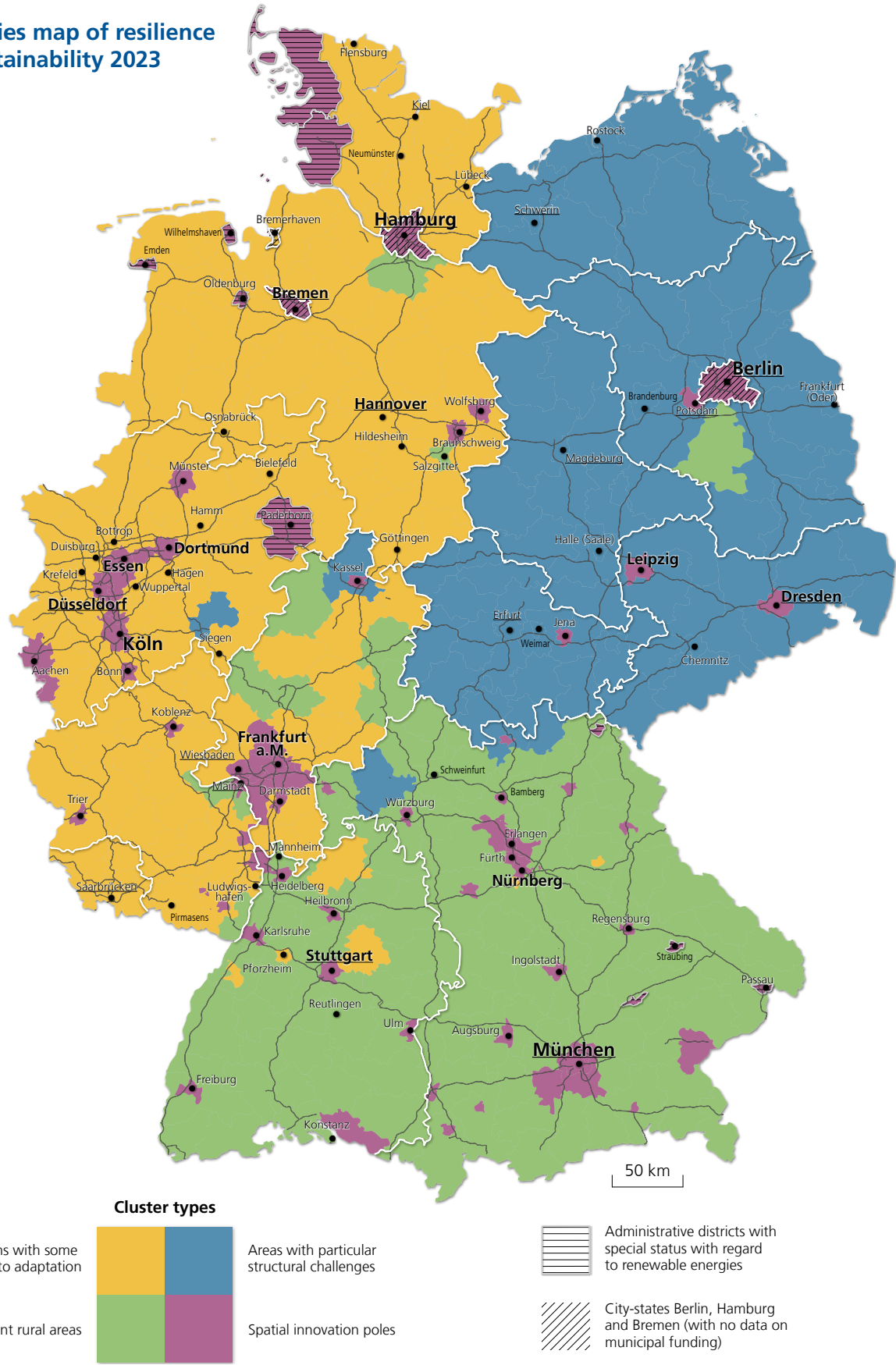| Characterisation	Indicator levels	Spatial areas
Regions with some obstacles to adaptation (142 districts, population 29 million)		
This region not only has a large amount of spatial overlap with Germany's solid middle in the disparities map presented earlier in this report, but its municipalities and districts have largely average results nationally with regard to resilience indicators. The relatively wide variety of types of employment also points to diverse economic structures without dominant sectors and specialisations. Nevertheless, these areas will need to overcome some obstacles to adaptation in order to ensure future development. Choke points include a comparatively low number of highly qualified foreign workers, a lower percentage of children under three in preschool, and weak local investment. Spatially, this cluster spans wide regions of rural northwestern Germany, but also includes larger cities such as Duisburg and Hanover.	Economic concentration: - (928) Knowledge-based jobs: o (20.1 %) New businesses: o (182 per 1,000 businesses) Patents: o (7.4 per 100,000 regular employees) Young to old employees: o (56.9) Foreign graduates: - (10.3 %) Preschool: - (29.5 %) Local investment: - (343 EUR per resident) Fibre optic cable access: o (63.5 %) Renewables: o (334 kW/km²) Passenger rail access: o (11)	

TABLE 6

Characterisation	Indicator levels	Spatial areas
Areas with significant structural challenges (75 districts, population 11.5 million)		
A low percentage of employees in knowledge-based jobs, a low number of highly qualified migrants, few new businesses and patent applications, low local investment in material assets, as well as a far below average expansion of fibre optic cable access all point to the major structural challenges facing this spatial area, largely found in the rural areas of eastern Germany. Its most formidable challenge is demographic: very few young workers are left to replace a large number of aging colleagues. Only the very high percentage of children in preschool, a remnant of the extensive childcare infrastructure of the GDR, shines as a positive factor. Spatially, this cluster region overlaps largely with the structurally weak areas with partially positive catch-up effects in the disparities map. This illustrates that the positive developments in many eastern German districts cannot be taken for granted. On the contrary, these regions will need to make a major effort to maintain their connection to the rest of Germany in the process of overcoming their future transformational challenges.	Economic concentration: o (962) Knowledge-based jobs: - (17.8 %) New businesses: - (87 per 1,000 businesses) Patents: - (5.1 per 100,000 regular employees.) Young to old employees: -- (39.5) Foreign graduates: - (8.6 %) Preschool: ++ (55.8 %) Local investment: - (401 EUR per resident) Fibre optic cable access: - (39.6 %) Renewables: o (324 kW/km²) Passenger rail access: - (10.7)	
Resilient rural areas (107 districts, population 18.5 million)		
This cluster type is located mainly in the medium-sized cities and districts of southern Germany, but also includes individual districts in western Germany, especially in Hesse and suburban Hamburg and Berlin. These regions tend toward average with regard to their innovation potential. Economic diversity, percentage of children in preschool, and fibre optic cable and passenger rail access are all below average. Despite these obstacles to adaptation, these areas' comparatively good demographic situation within their labour markets, above average attractiveness to highly qualified foreign labour, and especially the high levels of local investment in material assets indicate that these municipalities and districts are in a comparatively good position to withstand future transformational challenges and crises.	Economic concentration: + (1,009) Knowledge-based jobs: o (20 %) New businesses: o (182 per 1,000 businesses) Patents: o (9.4 per 100,000 regular employees) Young to old employees: + (61.7) Foreign graduates: + (13.6 %) Preschool: - (27 %) Local investment: ++ (713 EUR per resident) Fibre optic cable access: - (54.5 %) Renewables: o (296 kW/km²) Passenger rail access: - (10.7))	
Spatial innovation stars (76 districts, population 24.2 million)		
The municipalities and districts of this cluster type can largely be divided into two categories. On one hand are the large cities and metropolitan areas of Germany, marked by their extremely high concentration of knowledge-based jobs, fibre optic cable access, and passenger rail access. On the other hand, it includes a few rural areas (Schleswig-Holstein's North Sea coastline) that have particularly high levels of renewable energy production. As a result of this special status, these districts are highlighted with shading in the resilience and sustainability map. The regions of this cluster are above average on nearly all other measures. Only the high concentration of certain vocational groups points to a singular transformational challenge.	Economic concentration: + (1,034) Knowledge-based jobs: ++ (28.9 %) New businesses: + (538 per 1,000 businesses) Patents: + (12.8 per 100,000 regular employees) Young to old employees: + (64.8) Foreign graduates: + (12.8 %) Preschool: o (32.4 %) Local investment: o (437 EUR per res.) Fibre optic cable access: ++ (83.7 %) Renewables: + (511 kW/km²) Passenger rail access: ++ (15.7)	

FIGURE 4

Disparities map of resilience and sustainability 2023

Cluster types

Regions with some obstacles to adaptation		Areas with particular structural challenges
Resilient rural areas		Spatial innovation poles

Administrative districts with special status with regard to renewable energies

City-states Berlin, Hamburg and Bremen (with no data on municipal funding)

50 km

Source: Authors' presentation, based on: regional statistics, Federal Employment Agency statistics, Infas 360 GmbH, German Patent and Trademark Office, EON Energy Atlas, Bertelsmann Stiftung: Wegweiser Kommune (Community Roadmap), Federal Network Agency's Gigabit Land Register, gtfs.de, GeoBasis-DE/BKG 2021.

3.3 THE FUTURE IS SHARED UNEQUALLY: PAST POSITIVE DEVELOPMENT CANNOT BE TAKEN FOR GRANTED

Our cluster analysis reveals four spatial areas that are sharply differentiated in their sustainability. Let's start with the good news: more than half of all German residents (42.5 million) are currently living in regions (183 districts) with largely very high potential for the future and high crisis security. This is above all the case in the 'spatial innovation poles', which nearly one-third of the population call home. These are large cities and greater metropolitan areas with a high percentage of knowledge-based workers, an above average attractiveness to foreign graduates, a high concentration of new businesses, specialised workers and innovations (patent filings), as well as significant infrastructural advantages.

Former crisis areas with (partially) positive future prospects

It is important to note that the 'spatial innovation poles' are not simply a list of dynamic urban areas from the status quo analysis. There are also former industrial cities, for example a handful from the Ruhr valley (Dortmund, Essen, Mülheim) or Bremen. To take this example further, one-third of people living in the latter region, once plagued by crisis, are in cities with very good prospects for future development. Also eastern Germany with its innovation centres of Berlin, Dresden, Jena, Potsdam and Leipzig is well represented, accounting for around 30 per cent of the region's population. With substantial resources and potential, they are clearly positioned to overcome transformational challenges in the future despite current socioeconomic disadvantages.

The 'resilient rural areas', primarily in southern and southwest Germany, but also in individual locations in western and eastern Germany, enjoy similarly positive future potential. This is a result of their especially good demographic situation, their above average attractiveness to highly qualified foreign workers, and the high level of local investment potential that makes it possible to reduce or resolve today's infrastructure problems in the future.

Future hurdle: demographics

In contrast, northern and western Germany are home to a few rural 'regions with some obstacles to adaptation'. Many of the resilience indicators for these areas were simply average. The majority of these areas overlap geographically with 'Germany's solid middle' mentioned in the previous cluster analysis. Unfortunately, the analysis reveals weaknesses at the level of local government investment in the future, as well as a low level of attractiveness to highly qualified foreign workers who increasingly will be desperately needed.

Demographic collapse and a shortage of qualified labour are also the primary future challenges of the overwhelmingly eastern and rural 'areas with significant structural challenges'. A number of issues collide here: a low number of knowledge-based jobs, a below average attractive-

ness to highly qualified foreign workers, and a predictably severe shortage of qualified labour as a result of negative demographic developments. The past relocation of young people will have severely detrimental effects in the future.

Added to this, the region is investing far too little at the local level and hosts a below-average number of new businesses or innovations. This is proof that the catch-up successes of the past few years will not reach far into the future, and that special efforts must be made to both attract qualified labour and encourage local investment.

The East, again divided

A look into the future illustrates just as well as the status-quo analysis of disparities in Germany what makes the East so different: approximately one-third of all residents live in sustainable areas, either innovation poles or resilient rural areas. Locations such as Dresden, Leipzig and Jena and their spillover effects are as essential as those of the prosperous Berlin metropolitan area. Two-thirds of residents in eastern Germany, however, will continue to live in rural regions facing significant future challenges.

3.4 SPATIAL AREAS WITH FUTURE TRANSFORMATION RISKS

The future transition to a climate-neutral economy naturally affects all regions, but it will by no means affect all of them equally. Areas with an especially high number of so-called transformation industries will be significantly affected. These are primary industries with a high level of reliance upon fossil fuels in their production processes (that is, steel, metals, chemicals), as well as the powerful automobile industry and its many feeder companies, all of which are heavily affected by the transition to electromobility.

Figure 5 gives us a brief overview of where these industries are represented particularly heavily. The map shows generally a north–south divide, which is primarily a factor of the automobile industry. A much smaller concentration can be found in rural areas of the north and northeast, as well as in major cities such as Hamburg, Munich or Berlin, where industrial concentration is generally limited by the availability of space.

Thus, we can conclude that the future prospects of many large urban areas identified as 'innovation stars' are also strengthened by the lack of industries facing significant transformation. In Germany, component suppliers to major industry are generally located in somewhat rural areas and may be the primary employer in their region.

Figure 5 also shows the various levels of dependence on transformation industries in each region, although this says nothing about their ability to overcome these potential transformational risks. What is most important is how these regions can meet such transformational challenges as a result of their various resilience factors, and which regions will require additional assistance to do so.

Figure 6 shows the 30 regions with the most significant industrial transformation needs, colour-coded by resilience cluster type.

FIGURE 5

Percentage of employees working in energy-intensive industries (2022) and the automobile industry (2021)
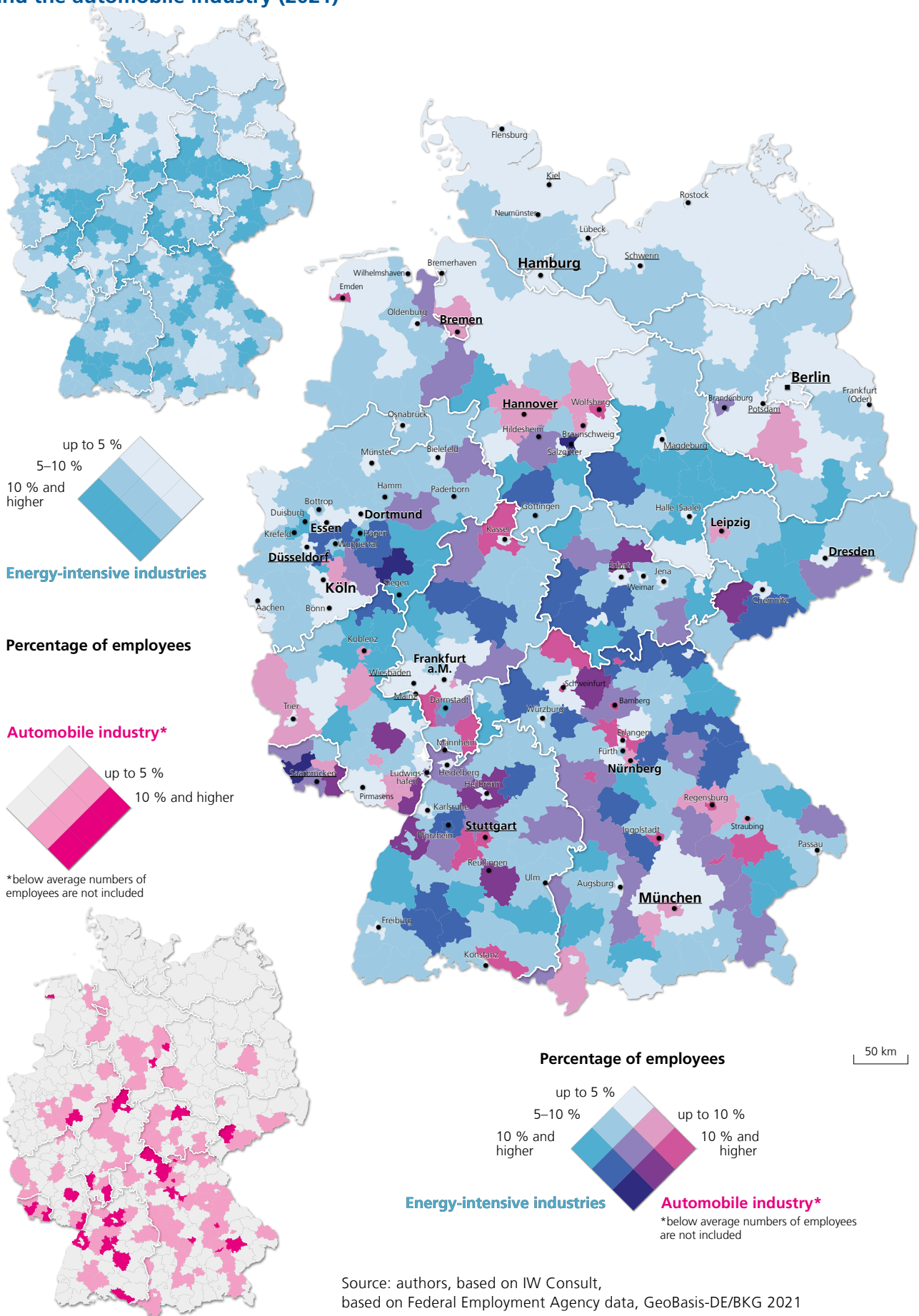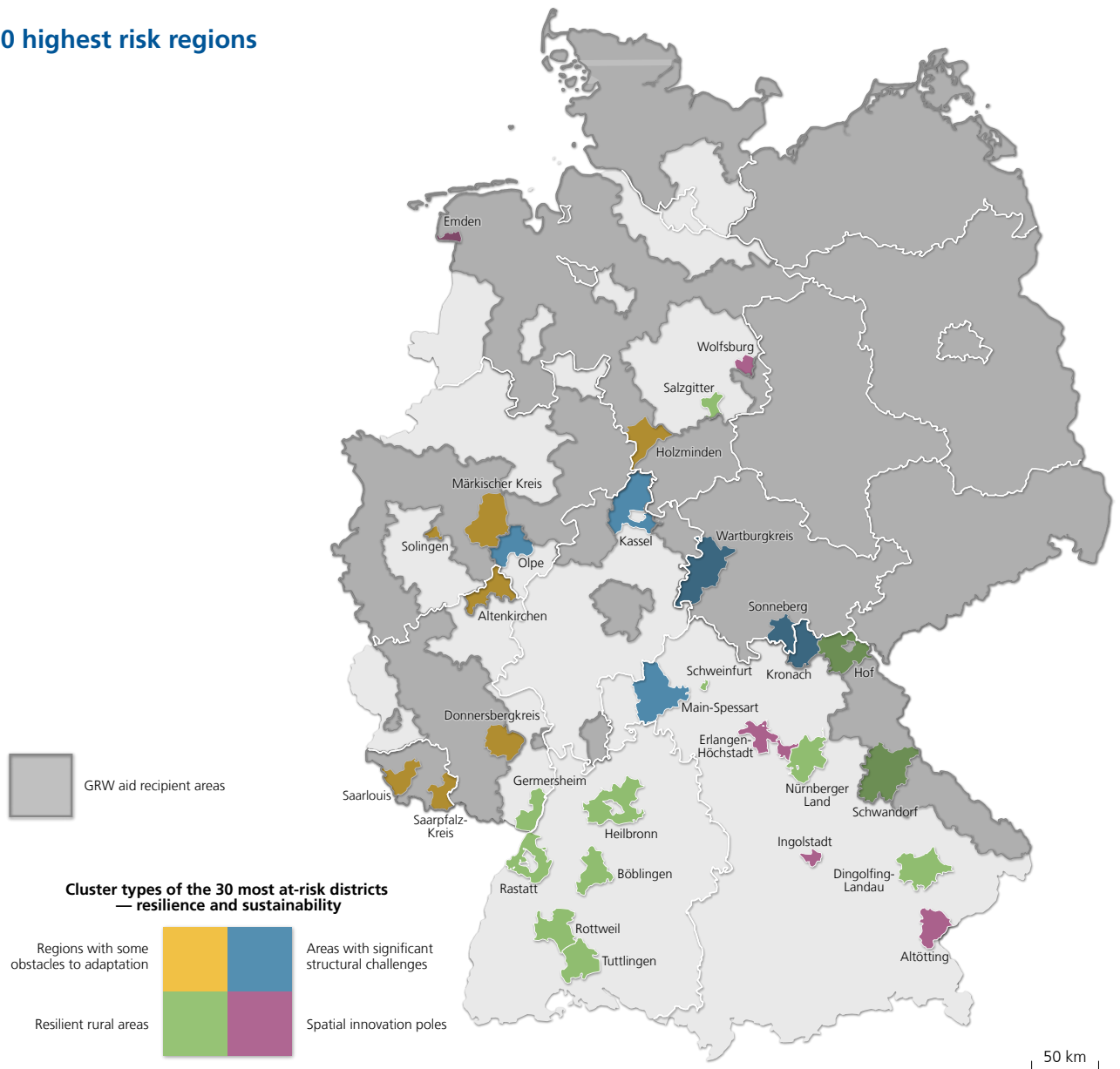

up to 5 %
5–10 %
10 % and higher

Energy-intensive industries

Percentage of employees

Automobile industry*

up to 5 %
10 % and higher

*below average numbers of employees are not included

Percentage of employees

up to 5 %
5–10 %
10 % and higher

up to 10 %
10 % and higher

Energy-intensive industries   **Automobile industry***

*below average numbers of employees are not included

50 km

Source: authors, based on IW Consult,
based on Federal Employment Agency data, GeoBasis-DE/BKG 2021

30 highest risk regions

Cluster types of the 30 most at-risk districts
— resilience and sustainability

GRW aid recipient areas

Regions with some obstacles to adaptation

Areas with significant structural challenges

Resilient rural areas

Spatial innovation poles

50 km

Source: authors, based on regional data, and data from the Federal Employment Agency, the German Patent and Trade Mark Office, the Bundesnetzagentur's Gigabit Grundbuch, and the Federal Ministry for Economic Affairs and Climate Action. GeoBasis-DE/BKG 2021

The first thing we observe is that eastern Germany, with the exception of two districts, is not characterised by a high concentration of the selected transformation industries.

Furthermore, the risk regions identified in the southern areas of Germany – with just one exception – are well situated to meet the challenges of industrial transformation as a result of their high levels of innovation and resilience.

The situation is more difficult for the risk regions located in western Germany (Saarland, North Rhine-Westphalia, Rhineland-Palatinate, Hesse). As Figure 6 shows, most of these regions are already participants in the state-federal GRW partnership for improvement of regional economic structures (darker shading). A rethink may be required for all instances in which this is not already the case.

4

REDUCING INEQUALITY: 10 GOVERNMENT POLICY RECOMMENDATIONS

SUCCESSFUL TRANSFORMATION REQUIRES NOT JUST SOCIAL, BUT ALSO REGIONAL REBALANCING

We have seen that the growth of the 2010s had a limited effect on promoting parity of living conditions across Germany. We now find ourselves in a decade of multiple crises (Covid-19 pandemic, intensifying world conflicts, demographic change and, last but not least, climate change). This study attempts to find not just past parameters of achievement, but also indicators pertaining to successful future handling of challenges at this turning point (*Zeitenwende*). These indicators should provide information on how well regions are prepared to face such challenges. We can conclude that there are clear differences between regions with regard to their future sustainability, and in large part they are in line with past disparities.

Regional transfer payments and the pursuit of parity of living conditions remain as significant for Germany's transformation to a non-fossil fuel-based economy as social transfer payments. Future investments are at the heart of the current debate over our path to transformation. Now we must ensure that we select the right tools and guarantee that they are put in place in order to achieve both social and regional balance. Besides additional investments, we also need to apply our existing resources with these spatial considerations in mind in order to achieve these goals. In this spirit, we present the following ten recommendations.

1. Use the remaining half of the government's term of office to put the coalition agreement into effect consistently

The current federal government (Social Democrats (SPD); Free Democrats (FDP); Alliance 90/The Greens) agreed on an ambitious plan to achieve parity of living conditions in their 2021 coalition agreement. The chapter 'Good living conditions, both urban and rural' lists a number of measures and initiatives that have been introduced in rudimentary form. What is important now is to implement them over the next two years, because, to quote the coalition agreement, 'Parity of living conditions is the basis of trust in our democracy and holds our country together.'

2. Strengthen municipalities

More than half of all public investment in Germany is made at the local level. It is an important pillar in shaping the transformation, and local government must therefore be in a position to make the necessary investments. One im-

Municipal budgets

Municipalities in Germany have considerable autonomy, enshrined in law, as the federal structure follows the principle of subsidiarity. In order to ensure the performance of responsibilities at even the lowest levels of government, adequate central funding (connexity) is required at a level that matches local services (equivalence); revenue collection and spending are further guided by the principles of solidarity and parity of living conditions (Muldoon-Smith et al.), the subject of our report.

To enable them to perform their duties, German municipalities are financed from a variety of revenue sources: shared and local taxes, fees and concessions, and aid and transfers. Shared taxes, such as local business and property taxes, are split upwards between the local, state and federal levels, while personal income taxes and value-added sales tax are divided downwards. Smaller local taxes, such as annual dog licensing and second-residence tax, are retained directly by the municipality. Fees for a wide range of public services are collected but charged at the cost of providing those services. Municipalities assess and retain concessions from utilities to install and maintain infrastructure under public rights of way. Finally, municipalities receive aid and transfer funding, largely from their states, to finance specific programmes, expand services, or fund infrastructure and capital investments. Only when all available resources are insufficient to cover public expenditures are municipalities allowed to borrow money, though they are somewhat restricted in this by the balanced-budget austerity measures commonly known as the debt brake (Muldoon-Smith et al.).

portant but as yet unfulfilled promise in the coalition agreement is a solution to the issue of municipal indebtedness. For many cities and regions that have struggled through the loss of major industries and fallen into a vicious circle of low economic strength, high unemployment, high numbers of welfare recipients and high levels of indebtedness, federal debt relief is a central requirement in order to kickstart future investment. This can be achieved only together with the states in question, whose debt relief initiatives[8] to this

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8 Local debt levels are an immense financial burden for many local governments and rising interest rates in particular jeopardise local households. Hesse, Rhine-Palatinate, Saarland and Saxony-Anhalt have introduced some debt reduction programmes for their municipalities, which introduce state level funds aimed at reducing such risks. The Saarland pact, for instance, is a special fund that covers local cash credits of roughly 1 billion euros. Since 2020, the fund has had 30 million euros available annually from the core budget and an annual average of 20 million euros of the assumed municipal liquidity loans.

point have been inadequate. Beyond this, we must develop a sustainable concept for financing local governments that allows them to plan for long-term investments.

3. Guarantee public services

The basic condition for promoting parity in living conditions is good infrastructure. It is a decisive factor in the attraction and retention of business and labour to structurally weak areas. This applies to business-oriented infrastructure (office space, transportation systems, energy supplies, and so on), as well as general social services (education, childcare, public transportation, city planning, housing stock and so on). The latter have endured a years-long, ever-growing lack of investment, especially in structurally weak, significantly economically-challenged regions. The coalition government's goal of ringing in a 'decade of investments' has not yet been met. One example is the reform of GRW (Gemeinschaftsaufgabe 'Verbesserung der regionalen Wirtschaftsstruktur' – Joint Scheme for the Improvement of Regional Economic Structures) measures, begun in 2023. Originally the plan was to make these funds available for public investment in public services as well. The resulting law capped assistance per *Land* at 10 million euros. This amount, given the cost of public service infrastructure, can be understood as merely symbolic.

Communal responsibilities: 'Improving regional economic structures' (GRW) and 'Common Funding System for Federal Measures'

GRW measures have existed since 1969 and are co-financed equally by the federal government and the individual states. Their intention is to promote structurally weak areas by creating incentives for investment and supporting economically significant infrastructure projects. A unified system of indicators defines the areas eligible for financing, based upon GDP per employed person, the underemployment rate, the expected number of employees through 2040, as well as infrastructure levels.

GRW is one element of the Common Funding System for Federal Measures, a collection of 21 smaller federal programmes devised primarily to improve structurally weak areas. It employs the same indicators as the GRW. Its present funding level is around 600 million euros annually.

4. Allow child welfare payments to contribute to regional rebalancing

The coalition government set the goal of fighting poverty in Germany and as a result has raised per-child benefits and rental assistance benefits, expanded educational scholarship grants (BAföG), introduced reforms to welfare

Local differences in early childhood education

Financing of early childhood education and care in Germany falls under the competence of the individual *Länder*. As a result, everything from responsible entities to funding per child varies widely across the country. Especially contentious is the variable quality of care nationwide as measured by the educational requirements for teachers as well as the ratio of children per adult allowed by law. There is a long-term shortage of qualified teachers. In most municipalities, the budget for early childhood education is cobbled together from local and state funding sources; for private providers and initiatives also some degree of self-funding is required, usually collected through additional fees or donations levied directly upon families. Recent federal aid programmes to expand access to preschool for all children from age 1 upwards have resulted in massive increases in per-child spending in *Länder* and communities where such access had previously been lacking.

payments, and increased the minimum wage. As the data show, poverty in Germany is not evenly distributed, but rather concentrated in urban areas, as well as in post-industrial and structurally weak regions. Therefore, poverty alleviation efforts to date have also to a large degree had a spatial component, even as current inflation levels decompensate the positive effects of these measures. This makes sufficient investment in the yet to be enacted child welfare reform proposal even more important. There are two more proposals to consider. First, the introduction of further Traffic Light coalition poverty alleviation measures (with florid titles such as the New Opportunities programme, the Qualification Opportunities programme, the Work of Tomorrow law, or the (Re-)Training law); and second, a minimum wage that follows EU guidance to be set at or near 60 per cent of the national gross median income rather than following national political whims. Compounding their impact, both of these measures will also help to stabilise structurally weak regions.[9]

5. Use limited resources more efficiently: bundle instruments and consider spatial factors

Within a federative, multilevel system, we have learned to accept that various assistance programmes and funding initiatives follow completely different operational goals. The federal government, the *Länder* and the European Union are the primary actors. Many of these funding programmes are spatially blind, that is, they do not take into account the widely varying needs of different regions. In a time of limited resources, bundling instruments and increasing regional focus is long overdue.

Therefore, one important proposal in the coalition agreement is the expansion of the 'Nationwide Assistance Dis-

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[9] Fundamentally all federal-state initiatives to promote education have the natural effect of helping to increase national levels of future skilled workers and to fight poverty, thereby also strengthening structurally weak regions.

tribution System'. This system is already at work combining federal funding programmes with the goal of applying them primarily in disadvantaged regions. However, this essential bundling of federal funding programmes has been applied to only a number of smaller programmes totalling approximately 1.3 billion euros annually. Thus, it has been far too weak to have any measurable spatial effect.

Therefore, the goal must be to concentrate this multiplicity of federal and state funding resources using spatial factors, focusing on an efficient application of funds based on regional needs. This insight follows the principles of the coalition agreement, which proposes a harmonisation, simplification and aggregation of the various funding programmes, more transparency in funding use, and review of all programmes and their spatial impact.

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"All federal assistance programmes will be regularly evaluated and reviewed for their spatial impact using uniform data standards. The results will be published in a periodical parity report[10] and advances with regard to parity of living standards made transparent."
(Federal government 2021)

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Relatedly, the Traffic-light coalition has made a big promise: 'We will […] prioritise sending resources to the areas where accumulated needs are greatest.' The second half of the legislative term must now be used to put these promises into action.

6. Stop following the principle of 'To he who has, more shall be given'

The federal government provides a large amount of financial assistance to *Länder* under Article 104b of the constitution (urban construction assistance), Article 104c (local educational infrastructure, digital pact for schools), and Article 104d (construction of social housing). This economic assistance is distributed almost exclusively through federal-state agreements which reflect each state's economic and financial strength (Königstein key); in short, rich *Länder* receive more than poorer ones. This distribution key must be replaced in the future to follow the principle of needs-oriented funding distribution. The most recent example following this principle is the anticipated federal New Opportunities programme, aimed at assisting disadvantaged schoolchildren. This is the first attempt by a federal funding programme to distribute aid according to actual needs.

A further example of the principle 'To he who has, more shall be given' is the distribution of funding for scientific research and development in Germany. In 2019, more than half of funding from the Federal Ministry for Educa-

Examples of spatially-blind federal funding programmes

Many of the federal government's federal assistance programmes have budgets in the billions, and while each has its own eligibility criteria, they in large part do NOT consider differences in regional or structural policy needs nor make any attempt at rebalancing. On top of that, they are often overly complicated and regularly fail to link up with similar measures.
A few examples:

- Law promoting local government investment (Kommunalinvestitionsförderungsgesetz) 2015 (7 billion euros, distributed, among other factors, by population size, even though only economically weak local governments were targeted)
- Federal transportation routes plan (Bundesverkehrswegeplan) 2030 (269.6 billion euros, distributed, among other factors, based on cost-use analysis)
- University pact (Hochschulpakt) 2007–2023 (20 billion euros, distributed based on size of student body)
- Investment in infrastructure for scientific research (Förderung der Forschungsinfrastruktur) (distributed by Königstein key)
- Good early childhood education law (Gute-Kita-Gesetz) (5.5 billion euros, distributed by Königstein key)
- Digital pact (Digitalpakt) I (6.5 billion euros, distributed by Königstein key)
- Regionalisation funds for local public rail transport (Regionalisierungsmittel für Schienennahverkehr) (distributed, among other factors, by population size)
- Urban development funding (Städtebauförderung) (distributed primarily by population size)
- Financial assistance for social housing construction (Finanzhilfen für den sozialen Wohnungsbau) 2020–2026 (14.6 billion euros, distributed by Königstein key)
- Assistance programme for the national hydrogen strategy (Förderprogramme der Nationalen Wasserstoffstrategie) (9 billion euros, distributed, among other methods, through a competitive application process)

tion and Research flowed into institutional and project-based funding in Germany's three city-states and three southern states (Baden-Württemberg, Bavaria, Saxony), just six out of 16 total states (Kohler/Buhr 2022). The funding thus went to the areas in which research infrastructure (universities and research institutes), as well as research-intensive companies are already located. It is high time the government began to work more intensively on creating a more spatially-balanced research infrastructure and promoting more strongly regionalised innovation policy.

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10 In the meantime, the federal government has announced its first 'parity report'. It is intended to focus on the spatial impact of aid programmes and any progress made thus far with regard to parity of living conditions.

The aforementioned federal parity report should not stop at analysis of the large amount of research funding, but must also examine the spatial significance of the many other federal funding programmes, as well as suggest concrete measures to promote spatial parity through a more efficient use of existing resources.

7. Use the transition to clean energy to promote parity of living conditions

The changes and insecurity unleashed by the climate and energy revolutions will be matched by the opportunities for economic growth and value creation. They might be one key to reducing regional parity differences. Regenerative energy production demands, first and foremost, space for wind and solar farms, which is most abundant in rural, more sparsely populated areas. The availability of ample renewable energy is already an important locational factor across all production-based industries but most significantly for energy-intensive factories. Regions with a high amount of wind energy are already ahead of the pack, as they deliver dependable energy even in winter months and achieve far more hours of full production capacity than solar.

The existing measures to speed up and simplify the construction of more onshore wind energy should be exploited above all by local governments in rural areas with undeveloped land. It is important to ensure that local residents in such regions benefit adequately from the added value of regenerative energy production in order to increase the acceptance of such projects. The profits from such projects could, for example, flow directly into public financing of local schools, social programmes, or the expansion of regional public transportation.

Structurally weak areas must also be considered when planning future investments, such as those in hydrogen infrastructure (pipelines, ports, electrolysers). Current go-

vernment plans do not go far enough: the update to the national hydrogen strategy has only committed to a hydrogen network that is 'developed in such a way that regional disparities are not exacerbated'. The potential for regional development in structurally weak regions, far removed from well-known industrial locations, requires greater consideration in order to ensure they are not left behind when it comes to future technologies. The multiplicity of assistance programmes under the auspices of the national hydrogen strategy must be developed in such a way that even rural and structurally weak regions can benefit from them.

The climate revolution also provides an opportunity to build up or redock new value-added chains, such as chip production facilities or newly developed circular economies.

8. Meet the challenge of demographic decline — expand capital-oriented grants with incentives for workers

The future number of skilled workers is of central importance to regional development potential. The shortage of skilled workers as a result of demographic decline essentially affects all regions, but especially hard hit are large areas of eastern Germany, as well as a few select western German districts. These areas have also exhibited lower percentages of knowledge-based jobs, lower attractiveness to foreign graduates, and lower levels of immigration over the past few years. Add to this the results of research by the Federal Institute for Research on Building, Urban Affairs, and Spatial Development (BBSR), which show excess mortality in today's GRW regions four times that of the rest of the country (Eltges 2022).

Alongside other indicators of regional resilience, demographic decline and the low number of knowledge-based workers are set to become the most significant choke

points for structurally weak areas.[11] For this reason, it is necessary to provide additional instruments to improve the availability of skilled workers in these areas alongside the primarily capital-oriented grants currently available. There are many possible options: for example, the opening of additional universities of applied sciences in close cooperation with local economic actors; improved educational policy which both increases the number of graduates and lowers the number of school-leavers; and in-migration recruitment programmes targeting skilled workers who've migrated away from their hometowns.

Such measures provide benefits in the medium to long term. In order to achieve short-term gains, additional incentives must be offered to make relocation for national and international skilled workers more attractive.

An historical precedent may be indicative here: the Law to Support Berlin's Economy helped postwar Germany to meet the skilled employment needs of West Berlin's geographically isolated economy through tax incentives.

Berlin Support Measures Law (Berlinförderungsgesetz)

A law to support (West) Berlin's economy took effect in 1950. Its aim, despite a series of changes, was to support the struggling city surrounded by the GDR. One result of Berlin's crisis-prone isolation was a massive labour shortage. One of the methods employed to attract workers from West Germany was a 30 per cent reduction in the income tax rate, as well as a tax-free bonus of 8 per cent of gross income for employees (Berlin supplement).

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9. Increase confidence and make progress visible

Create flagship transformation projects: Trust in climate-neutral transformation efforts, above all in areas facing heavy costs of transition, rises to the degree that positive examples of successful transformation are made visible. Such 'flagship transformation projects' or 'confidence boosters' could include industrial location successes (for example, those in eastern Germany, such as Grünheide: Tesla gigafactory; Schwarzheide: BASF plant for cathode materials and battery recycling; Magdeburg: Intel; Dresden: Infineon and TSCM semiconductor factories); the successful reorientation of regions previously dependent on the automotive industry; good examples of hydrogen-based systems; or good practices in circular economies.

Overcome 'complexity traps' and institute transparency methods: Germany's federal structure and its multi-layered system create a multitude of actors, initiatives and programmes, all striving to develop various regions. The federal, state, regional and local governments, as well as the European Union all have their own competences and responsibilities. Such a diversity of ideas and initiatives can certainly have benefits, but often also leads to incoherence and opacity. In order to overcome the problem of complexity, progress must be made visible and verifiable for citizens. Numerous formats developed in the past have proven themselves useful in increasing transparency and, given the challenges of the required transformation, should be implemented more regularly. They include city-wide exhibitions, garden shows, and international technology and construction exhibitions. Each of these formats presents attractive, interdisciplinary examples of successful transformations in a given region. In future, these connective formats should be organised in a number of transformation regions and co-financed by federal and state governments. Possible sources of funding include the EU's structural funds or the GRW.

Develop new forms of participation and regional models: Many regions have successfully developed regional models or development plans. The goal is the independent formulation of regional or local development maps, which can be used as the basis for project funding requests at the *Land* or federal level. It is important to involve as many actors as possible at the local level. Such processes can strengthen local competences and regional self-determination and influence, thereby aiding 'regional empowerment' (Fröhlich et al. 2022). Once again, possible sources of funding include the EU's structural funds or the GRW.

10. Ensure the state functions properly, at every level, in every region

In times of great uncertainty, people want to depend on a state capable of effective action. This is especially true in regions facing serious challenges. The state is therefore called upon to act: citizens expect fit institutional actors, armed with the necessary public servants, especially at the local and regional level; a functioning infrastructure and adequate public services; fast and unbureaucratic processes; and more opportunities for participation. These are all high expectations requiring adequate funding. Ultimately, however, this amounts to an investment in achieving parity of living conditions and strengthening confidence in our democracy.

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11 US economist Richard Florida's research underlined the availability of technological and economic creativity as an important prerequisite for the economic success of cities and regions. In his view, the 3 Ts (talent, tolerance and technology) play a decisive role for creative knowledge workers in deciding where to base themselves. There have been various attempts to apply Florida's insights to explain the economic development of German regions (for example, Gottschalk/Hamm (2011)).

APPENDICES

APPENDIX A:
INDICATOR DOCUMENTATION

The following tables give an overview of the indicators used in the study, their sources and their reference years. For indicators with multiple reference years, we created an annual average for the time period shown in order to balance out possible short-term variations. For all indica-tors in the disparities map, with the exception of average travel time to GPs, we analysed changes over the most recent five-year period (four-year period for life expectancy and voter participation) of available data.

#	Definition	Sources	Reference years
Cluster analysis			
Fig. 1	Disparities map	Federal Employment Agency, BBSR (Federal Institute for Research on Building, Urban Affairs, and Spatial Development), Bundesnetzagentur, Federal Statistical Office of Germany, Thünen Institute (Federal Research Institute for Rural Areas, Forestry and Fisheries), Bertelsmann Stiftung's Wegweiser Kommune (Community Roadmap) and its raw data	2017, 2018, 2019, 2020, 2021
Economic activity and labour market			
	Percentage of regular employees with a university degree by residence (%)	Federal Statistical Office of Germany	2021
Education and opportunities			
	Child poverty: Share of children under 15 living in households receiving welfare benefits, as a percentage of all children under 15	Bertelsmann Stiftung's Wegweiser Kommune	2020
	Old-age poverty: percentage of welfare recipients above retirement age, as well as long-term disability recipients from 18 years of age	Bertelsmann Stiftung's Wegweiser Kommune	2020
Wealth and health			
	Accessibility of general practitioners in driving time (minutes)	Thünen accessibility model; GP locations: POI-Bund, Datenstand Arztstandorte 10/2020	2020
	Average life expectancy of a newborn in years	BBSR (Federal Institute for Research on Building, Urban Affairs, and Spatial Development)	2017–2019
	Gross monthly income by residence (median)	Federal Employment Agency	2021
State action and participation			
	Share of households with broadband access ≥ 50 Mbit/s, as a percentage of all households	Bundesnetzagentur's Gigabit-Grundbuch	2022
	Municipal debt in euros per resident	Bertelsmann Stiftung's Wegweiser Kommune	2020
	Percentage of voters casting ballots among all eligible voters for the federal parliamentary elections 2021	Federal Statistical Office of Germany	2021
Migration			
	Total net in-migration (arrivals minus departures), averages for each of the reference years per 100,000 residents	Federal Statistical Office of Germany	2018–2020

#	Definition	Sources	Reference years
Cluster analysis			
Fig. 2	Wealth and poverty in Germany	Federal Employment Agency, Empirica, Federal Statistical Office of Germany, Bertelsmann Stiftung's Wegweiser Kommune (Community Roadmap)	2020, 2021, 2023
Wealth			
	Gross monthly income by residence (median)	Federal Employment Agency	2021
	Rent to income ratio: percentage of household income used to pay rent per person in the household	Federal Statistical Office of Germany, Empirica, Bertelsmann Stiftung's Wegweiser Kommune, authors' calculations	2020, 2021, 2023
Education and opportunities			
	Child poverty: share of children under 15 living in households receiving welfare benefits, as a percentage of all children under 15	Bertelsmann Stiftung's Wegweiser Kommune	2020
	Old-age poverty: percentage of welfare recipients above retirement age, as well as long-term disability benefit recipients from 18 years of age	Bertelsmann Stiftung's Wegweiser Kommune	2020

#	Definition	Sources	Reference years
Fig. 3	Pre-tax inherited and endowed asset value per death	Federal Statistical Office of Germany, analysis of inheritance and endowed assets tax statistics	2017–2021

#	Definition	Sources	Reference years
Cluster analysis			
Fig. 4	Resilience and sustainability	Federal Employment Agency, Bundesnetzagentur, German Patent and Trade Mark Office, Infas 360 GmbH, Federal Statistical Office of Germany, statistical offices of the *Land* governments, Bertelsmann Stiftung's Wegweiser Kommune, gtfs.de, EON Energieatlas	2018, 2019, 2020, 2021, 2022
Economy, employment and labour market			
	Economic concentration: HHI on the basis of vocational classifications	Federal Employment Agency	2022
	Percentage of regular employees in knowledge-based jobs by workplace location	Federal Employment Agency	2022
	Intensity of new businesses: net number of opening businesses minus closing businesses per 1,000 businesses	Infas 360 GmbH, Commercial Register	2020
	Number of patent applications per 100,000 regular employees by workplace location	German Patent and Trade Mark Office (DPMAregister)	2019–2022
	Ratio of regular employees under 30 years of age to those over 50 and under 65 years of age (%)	Federal Statistical Office of Germany	2022
Education and opportunities			
	Share of non-German employees with a university degree out of all employees with a university degree by workplace location (%)	Federal Statistical Office of Germany	2022
	Percentage of children under three years of age in preschool	Federal Statistical Office of Germany	2021
State action and participation			
	Local investment in material assets in euros per resident	Bertelsmann Stiftung's Wegweiser Kommune	2018–2020
	Percentage of households with broadband access ≥ 1,000 Mbit/s (fibre optic cable access)	Bundesnetzagentur's Gigabit-Grundbuch	2022
	Maximum output from wind, solar, water and biomass energy production in kW per km²	EON Energieatlas	2021
	Passenger rail accessibility index	Authors' calculations, DELFI-data, OpenStreetMap	2022

#	Definition	Sources	Reference years
Fig. 5	Percentage of regular employees in energy-intensive industries and the automobile industry	Automobile industry: IW Consult GmbH Energy-intensive industries: Federal Employment Agency statistics	2021, 2022

APPENDIX B:
METHODOLOGICAL NOTES

This report is based on the study Unequal Germany: Socioeconomic Disparities 2023 by Heider et al. The study, as well as this report, evaluated representative indicators in various subject areas. When using this popular method of spatial observation, it is important to differentiate between indicators and purely statistical regional variables (such as population or geographical area). Indicators have an illustrative effect for a given issue, thereby providing a robust evaluation of present conditions and trends necessary for targeting social and policy measures. One example is the policy aim of universal broadband access in Germany. This goal has been measured with an indicator of the percentage of households in each area of analysis (in this case, municipalities and districts) with access to high connection speeds. The relevant trends and values make it possible to compare the averages of 400 German municipalities and districts or different spatial areas more easily and provide a better understanding of the geography of socioeconomic disparities. That is the subject of this report, and the cartographic representations of data have been interpreted accordingly. However, this often disguises growing divides within particular districts. Such local gaps cannot be seen from the values included in the maps provided here. The following **methodological notes** should be taken into account when interpreting the data:

- The indicators used have been normed to averages (arithmetic average, median) or comparative measures of reference (for example, net migration per 100,000 residents, average driving time in minutes), meaning that the results are not dependent on size or population. This methodology ensures the comparability of indicator values across large analytical units of various population sizes.
- The interpretation of urban–suburban relationships between municipalities and bordering districts can be influenced by the different sizes of these territorial units. As a result of re-zoning efforts, many suburban areas of large eastern German municipalities have been extended quite far, meaning the average values for these districts include both typical suburban areas as well as areas of a more rural character.
- As state budgets for the city-states of Berlin, Hamburg and Bremen are not comparable with the local budgets of municipalities and districts, we could not analyse the indicator 'local debt levels' for the aforementioned cities. In the disparities map, this methodological deviation in spatial area assignment is indicated with shading.

- The Herfindahl-Hirschman Index (HHI) used in the map to illustrate resilience and sustainability is widely used in economics to measure market concentration or (regional) economic specialisation (cf. Vöpel/Wolf 2018). In this case, the index was calculated on the basis of the binary classification of vocational classes (KIdB 2010), as data on employees was available for municipal and district levels without data privacy censorship, as opposed to the more restricted data classifying economic branches (WZ 2008). The HHI is defined as the sum of the squared percentages of all vocational classes in a region divided by total employment in the same region. Possible index values range from 0 to 10,000, where 0 can be interpreted as maximum economic diversity and 10,000 maximum concentration or specialisation. High regional economic diversification is seen as a good indicator of higher resilience to global crises, as it reflects a lower dependence on individual branches or jobs. It should not be overlooked, however, that a certain level of specialisation is indeed required to generate innovation and growth (Frenken et al. 2007).
- The index for rail accessibility used in the map on resilience and sustainability was developed by the ILS on the basis of the DELFI data set that includes the railway schedule data for all 6,115 passenger rail stations in Germany. Based on traffic patterns between 6 a.m. and 10 p.m., the train stations were rated on a point scale from 0 to 23, where 23 represents a very high frequency of departures, on average fewer than 5 minutes between local departures and 15 minutes for long-distance departures. The frequency of local services was weighted higher by a factor of three over the frequency of long-distance services. Finally, the average distance (in minutes of car travel) to the closest train station was plotted using a map grid of 1-km² cells. A distance-weighted accessibility index for each individual cell was calculated with the help of the so-called decay function. In the final step, the values were then weighted by population and aggregated into spatial areas, such as cities, municipalities or districts. The final rail accessibility index has a theoretical range of values from 0 to 23 (for further details on this calculation, see Eichhorn et al. 2023).

- We also visualised the development of certain indicators over the past five years (see Table 3). These developments are based on the time ranges indicated in the table mentioned above. As public statistics are often subject to a publication lag, current developments such as the longer-term effects of the Covid-19 pandemic or the negative economic impacts of the war in Ukraine have not been reflected in the available data. These developments should not be understood as a direct update of the previous disparities report from 2019, as the definitions of various indicators had to be adjusted as a result of the availability of specific data.

Indicator selection for the three cluster analyses was carried out with the intention of covering all report topics without complicating interpretability. Experience in spatial analysis has shown that cluster analyses with too broad a set of indicators in part targeting similar circumstances are ultimately too difficult to explain. We chose to apply the same algorithm for the cluster analysis used in our previous studies, the hierarchical Ward method, in which individual districts can be added together step-by-step into increasingly large clusters. For each cluster, we then calculate the sum of the squared distance of individual cases from the centre of each cluster in n-dimensional space. These values are then added together. In the next step, we combined the two clusters whose fusion resulted in the lowest increase in the total sum of the squared distances. It was left up to the individual researcher where this process ends and how many clusters are ultimately observed.

   Even if the five spatial areas of this report's disparities map have a high degree of overlap with the spatial areas of the 2019 report's disparities map, the two should not be compared with one another directly. For one, the data sources and/or the definitions of certain indicators used for the cluster analysis changed as a result of the data presently available. As a result, the variables used are not directly comparable. Furthermore, cluster analysis as an exploratory statistical procedure is fundamentally unsuitable for a comparative analysis of different time periods. The aforementioned algorithm gradually combines all 400 municipalities and districts into the represented clusters on the basis of their similarities across all indicators. In this process, we discover edge cases where the constellation of indicators points to two or more clusters. Minimal changes in the values (of the specific districts, but also of all other districts within their cluster) can lead in such edge cases to a different sorting outcome within the framework of the iterative cluster process. Thus, assignment of a municipality or district to a different cluster type in the present versus the 2019 study should not be understood as an up- or downgrading of any kind.

The averages of the cluster or spatial type in the tables are compared with the averages of all 400 municipalities or districts in order to provide a description. Deviance from the average is represented symbolically (for statistical values: far above average: ++; above average: +; average: o; below average: -; far below average: --); the boundaries between these categories are oriented on the standard deviation of the indicator in question. Far above average is a value at least one standard deviation over the average of all districts; above average is a value at least 0.25 standard deviations over that average. Changes to the average are represented with arrow symbols (strong increase ↑; increase ↗; stagnation ○; decline ↘; strong decline ↓). A strong increase is one more than one standard deviation. Changes of less than 0.25 standard deviations are defined as stagnation. In order to improve their interpretation, the symbols are displayed in different colours, allowing for a normative orientation of the average deviations. Greens mark a positive deviation or development, reds a negative one.

Indicator	Year	Value ranges from … to …
Percentage of regular employees with a university degree	2021	6.8% (Wittmund) to 47.1% (Heidelberg)
Child poverty	2020	1.8% (Pfaffenhofen a. d. Ilm) to 40.4% (Gelsenkirchen)
Old-age poverty	2020	0.5% (e.g., Erzgebirgskreis) to 9.4% (Offenbach am Main)
Accessibility of general practitioners	2020	2.1 minutes (München) to 9.6 minutes (Uckermark)
Average life expectancy of a newborn	2017–2019	78.1 years (Bremerhaven) to 83.7 years (Starnberg)
Median income by residence	2021	2,636 EUR/month (Görlitz) to 4,579 EUR/month (Erlangen)
Broadband access	2022	27.6% (Odenwaldkreis) to 100% (Offenbach am Main)
Municipal debt	2020	0 EUR/resident (Stuttgart) to 9,868 EUR/resident (Pirmasens) *
Electoral participation	2021	63.4% (Salzlandkreis) to 85.5% (Starnberg)
Net in-migration	2018–2020	–653 per 100,000 residents (Heidelberg) to 1,613 per 100,000 residents (Barnim)
Rent to income ratio	2020, 2021, 2023	12.7% (Erzgebirgskreis) to 29.4% (Merzig-Wadern)
Economic diversity: HHI	2022	836.6 (Nordwestmecklenburg) to 2,055.6 (Wolfsburg)
Percentage of regular employees in knowledge-based jobs	2022	11.1% (Dingolfing-Landau) to 43.1% (Main-Taunus-Kreis)
Intensity of new businesses: net number of business openings and closings	2020	–5.2% (Hof) to 37.1% (Bonn)
Patent applications	2019–2022	3 applications/100,000 residents (Dessau-Roßlau) to 5,003 applications/100,000 residents (Erlangen-Höchstadt)
Ratio of younger to older employees	2022	28.1% (Spree-Neiße) to 80.5% (Cloppenburg)
Percentage of highly qualified foreign workers	2022	4.6% (Greiz) to 24.8% (Erding)
Percentage of children under three in preschool	2021	16.4% (Memmingen) to 65% (Spree-Neiße)
Local investment in material assets	2018–2020	60 EUR/resident (Flensburg) to 1,397 EUR/resident (Dingolfing-Landau) *
Fibre optic cable network access	2022	8.6% (Altenkirchen) to 99.9% (Ingolstadt)
Maximum renewables output capacity	2021	52 kW per km² (Garmisch-Partenkirchen) to 2,096 kW per km² (Emden)
Passenger rail accessibility	2022	1.4 (Lüchow-Dannenberg) to 21.8 (Bamberg)
Percentage of employees working in energy-intensive industries	2021	0.2% (Wolfsburg) to 32.3% (Altötting)
Percentage of employees working in the automobile industry	2020	3.6% (Mettmann, Ilm-Kreis, Starnberg, Enzkreis, Traunstein) to 43.7% (Wolfsburg)**

Notes: * excluding the city-states Berlin, Bremen, Hamburg; ** districts with below average percentages are not included in the data set.

FIGURES AND TABLES

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