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Regional climate dividend provides relief to rural households, but hardship cases remain

- Carbon pricing is an important climate policy instrument for reducing carbon emissions
- Flat-rate climate dividend compensates for regressive distribution effects, but hardship cases remain
- A staggered climate dividend can compensate for regional imbalances and may increase acceptance in rural areas

LEGAL AND EDITORIAL DETAILS

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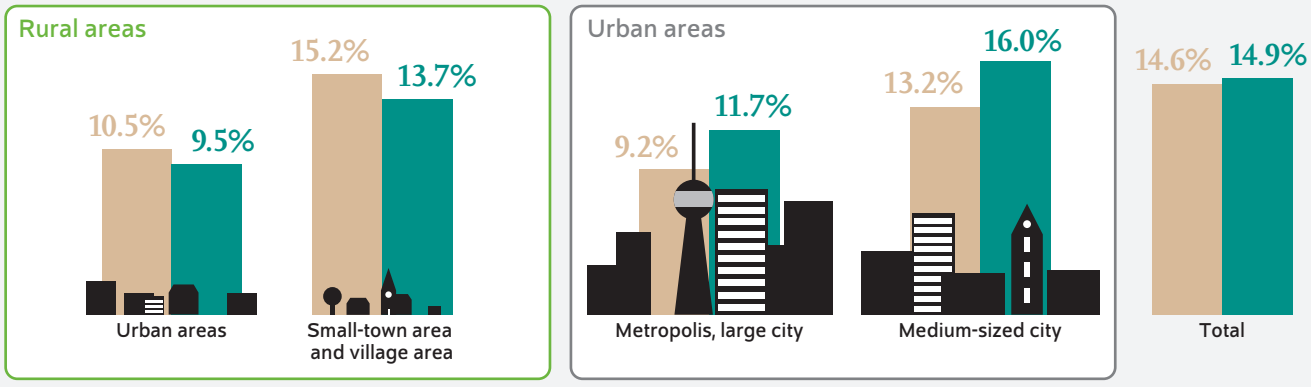
AT A GLANCE

Regional climate dividend provides relief to rural households, but hardship cases remain

By Stefan Bach, Rebecca Engelhardt, Lars Felder, Peter Haan, and Renke Schmacker

- Higher carbon pricing is an important climate policy instrument for reducing carbon emissions in Germany and Europe
- Flat-rate climate dividend compensates for regressive distribution effects of carbon pricing, but cannot prevent some households from having a high burden
- Staggering the climate dividend between rural and urban areas as done in Austria can compensate for regional imbalances
- A staggered climate dividend would increase the share of social hardship cases in large cities and decrease the share in rural areas
- This could increase acceptance of carbon pricing in rural regions, but further measures are required due to social hardship cases

Regionally staggered climate dividend decreases the share of heavily burdened low-income households in rural areas; overall, however, it changes nothing in terms of social hardship cases



Source: Microsimulation analyses using Socio-Economic Panel data (SOEP v37).

Note: Carbon price of 160 euros per ton plus VAT. Twenty percent of private households with the lowest income that have a burden of over one percent of their household income.

FROM THE AUTHORS

"A regionally staggered climate dividend could compensate for the unequal burdens between cities and rural regions. Such staggering results in fewer social hardship cases in rural regions, but more in cities. Although this does not do much in terms of social policy, it could increase the acceptance of carbon pricing in rural regions if the climate dividend relieves low-earning households." — ***Stefan Bach*** —

MEDIA

Audio Interview with Stefan Bach (in German)
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Regional climate dividend provides relief to rural households, but hardship cases remain

By Stefan Bach, Rebecca Engelhardt, Lars Felder, Peter Haan, and Renke Schmacker

ABSTRACT

The previous federal government coalition had planned to pay private households a climate dividend to offset rising carbon prices; a payout process was even prepared. However, the climate dividend is nowhere to be seen in the new federal government's coalition agreement. In the long term, a social compensation mechanism will be important, as prices for fossil and heating fuels will continue to rise due to the European Emissions Trading System (EU-ETS2). The simulations in this Weekly Report show that a climate dividend would contribute significantly to offsetting the financial burden from rising carbon prices, especially for low-earning households, while simultaneously maintaining the incentive of the price signal. Moreover, there are structural differences between urban and rural areas, which a regionally staggered climate dividend can account for. According to the present calculations, such staggering lowers the share of social hardship cases in rural areas, while increasing the share of them in cities. Although a regionally staggered climate dividend may not help to offset hardship cases overall, it could boost acceptance of carbon pricing in rural areas. To increase the targeted effect, the climate dividend could be reduced for higher incomes, which would open up additional fiscal leeway for relieving social hardship cases.

Carbon pricing is a key instrument of climate policy in Germany and Europe with the goal of reducing emissions over the long term. Since 2005, the carbon emissions of the energy industry, industrial processes, other large combustion plants, and aviation have been covered by the European Emissions Trading System (EU-ETS1). In 2021, Germany introduced an additional national emissions trading system for fossil and heating fuels, which prices carbon emissions for heating and car fuels. Currently, the carbon price is 55 euros per ton but will rise up to 65 euros per ton in 2026. In 2027, a European emissions trading system (EU-ETS2) will be introduced for these sectors, which will cause fossil and heating fuel costs to rise further. According to studies, prices of up to 160 euros per ton are possible in the long term.[1] Compared to the current level, fuel prices at gas stations (plus VAT) would permanently rise by around 30 cents per liter due to such a carbon price. Heating oil would also increase by around 30 cents per liter and natural gas by 2.3 cents per kilowatt hour.

Carbon pricing burdens low-earning households much more than higher-earning households.[2] This is because on average, low-earning households spend a higher share of their net income on energy and transportation costs than above-average and high-income earners. In addition, the tax burden varies between the income groups depending on the energy efficiency of people's homes or their transportation behavior. If carbon pricing causes a permanent increase in energy costs, there is a risk of social hardship cases, especially if people are unable to make adaptations, for example if they live in rental housing.

A flat-rate, per capita climate dividend paid to all residents in Germany has long been discussed as a solution for offsetting the various carbon pricing burdens and mitigating the related social hardship cases during the transition phase. The previous federal government coalition had planned such

1 Michael Pahle et al., *Wie weiter mit dem ETS2? Vorschläge und Erwägungen zur Stärkung der Glaubwürdigkeit* (Konrad-Adenauer-Stiftung, 2025) (in German; available online. Accessed on June 18, 2025. This applies to all other online sources in this report unless stated otherwise).

2 Stefan Bach et al., "Carbon pricing: Swift introduction of a climate dividend needed, reduce at higher incomes," *DIW Weekly Report* no. 43/44 (2024): 251-259 (available online).

DOI: https://doi.org/10.18723/diw_dwr:2025-27-1

a climate dividend and prepared a payout procedure, which may be ready by the end of 2025.[3]

In addition to income, private households also differ by region in terms of how much they are burdened by rising carbon prices. People living in rural areas generally have higher costs compared to people living in cities. They often travel further distances and are less frequently able to use public transport. They have larger homes on average and use heating oil more frequently, which is taxed more heavily by carbon pricing than gas or district heating. In addition, rural areas are less dense than metropolitan areas, which tends to increase heating energy consumption. Thus, the climate dividend could be regionally staggered, as was the case with the climate bonus in Austria before it was scrapped from 2025 over the course of budget cuts (Box 1).

This Weekly Report analyzes the effects of carbon pricing on fossil and heating fuels on private households.[4] A very high carbon price of 160 euros per ton, which could be reached under the EU-ETS2 in the long term, is simulated. Further, it is shown how a per capita climate dividend of 360 euros per year could offset the associated burden. In addition, the effects of a flat-rate climate dividend are compared with the effects of a regionally staggered climate dividend (Table 1). Regional staggering distinguishes between urban and rural areas, as the climate bonus in Austria did. Behavioral effects of carbon prices on transportation behavior are also examined by region. The behavioral adjustments in transportation included in the analysis are based on a survey experiment. Behavioral effects in transportation are especially important, as emissions have not been reduced enough over the past two decades in this sector to achieve the federal climate action target.

Carbon pricing burdens poorer households more than rich households

We use a microsimulation model based on Socio-Economic Panel (SOEP) household data from 2020 to analyze the distributional effects of carbon pricing.[5] The data is calibrated with the macroeconomic aggregated data and extrapolated to 2024.[6] The simulations assume that the carbon price is passed through fully to the final fossil and heating fuel consumption prices. Effects on businesses and other product prices as well as the effects of the European Emissions

Box 1

Regional distribution effects of carbon pricing and a staggered climate dividend as in Austria

The analysis of the regional distributional effects of carbon pricing uses the Regional Statistical Spatial Typology for Mobility and Transport Research (RegioStaR) by the Federal Ministry of Transport and Digitial Infrastructure (*Bundesministerium fuer Digitales und Verkehr*, BMDV).[1] The types of regions are formed from the spatial typology of the RegioStaR 17 in accordance with RegioStarGem7. Metropolitan areas, regiopolises, large cities, and central cities are combined into one group. The resulting four types of regions are metropolises and large cities, medium-sized cities, urban areas, and small-town and village areas. Using these four regions, the climate dividend is regionally staggered, similar to the process for the Austrian climate bonus.

The per capita climate bonus in Austria was paid in 2023 and 2024 to offset the carbon pricing burden, which is at a similar level as in Germany. The climate bonus was divided into four regional categories, which were based on the degree of urbanization and the availability of public transport.[2] Due to budget cuts, the Austrian climate bonus ended in 2025.[3]

To implement a climate dividend in Germany, the normative base would have to be discussed in more detail and operationalized in terms of regional statistics. For example, the availability of public transport or of gas or district heating could be weighed more heavily and be determined for all localities.

The microsimulation model based on SOEP data is used to determine the impact of a carbon price of 160 euros per ton according to four summarized spatial types. The model results in a significant and comparable differentiation of the burden within the four types of regions (Figure 3).

1 The 17 spatial types of the RegioStaR 17 are available for the individual SOEP data sets and are used as a part of the microsimulation model. Cf. Federal Ministry of Transport and Digital Infrastructure (BMDV), *Regionalstatistische Raumtypologie (RegioStaR)* (Dezember 2021) (in German; available online).

2 Bundesministerium für Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie, *Klimabonus* (2024) (in German; available online).

3 Parlament Österreich, "Klima- und Umweltbudget: Große Einsparungen durch das Aus des Klimabonus. Neben Budgetkürzungen auch zusätzliche Mittel vorgesehen," *Parlamentskorrespondenz* no. 509 (2025) (in German; available online).

3 Federal Ministry of Finance, "Bundesregierung bringt Eckpunkte für einen Direktauszahlungsmechanismus auf den Weg," press release from December 18, 2024 (in German; available online).

4 The distribution analyses are based on the following studies: Swantje Fiedler et al., *Regionales Klimageld in Deutschland. Potenziale, Herausforderungen und Verteilungswirkungen* (Rat für Nachhaltige Entwicklung, 2025) (in German; available online); Stefan Bach et al., "Ausgestaltung einer Klimaprämie in Deutschland. Möglichkeiten und Wirkungen einer Staffelung nach Einkommen oder Regionen," *Climate Change* 65 (2024) (in German; forthcoming).

5 The SOEP is an annual representative survey of private households. It began in West Germany in 1984 and expanded its scope to include the new federal states in 1990; cf. Jan Goebel et al., "The German Socio-Economic Panel (SOEP)," *Journal of Economics and Statistics* 239, no. 29 (2018): 345-360 (available online). We use data from the 2020 SOEP survey wave (v37, available online), in which detailed information on energy consumption was collected. The onset of the coronavirus pandemic during the survey period did not have a noticeable impact on the results, as the respondents apparently mostly stated their previous energy consumption. For more on the data preparation methods, see Stefan Bach and Jakob Knautz, "Hohe Energiepreise: Ärmere Haushalte werden trotz Entlastungspaketen stärker belastet als reichere Haushalte," *DIW Wochenbericht* no. 17 (2022) (in German; available online); Isabel Schrems et al., *Wirkung des nationalen Brennstoffemissionshandels – Auswertungen und Analysen. Grundlagen für den ersten Erfahrungsbericht der Bundesregierung gemäß § 23 BEHG im Jahr 2022* (Umweltbundesamt: 2022) (in German; available online).

6 We use data from the *Energiebilanz*, environmental-economic accounting (*Umweltökonomische Gesamtrechnungen*, UGR), energy tax statistics up to 2022, the official May 2024 tax estimate on energy and electricity taxes until 2028, the national accounts up to 2023, and the Spring 2024 Joint Economic Forecast.

Table 1

Burdens on private households with a carbon price of 160 euros per ton[1] by region category[2]
In percent or euros

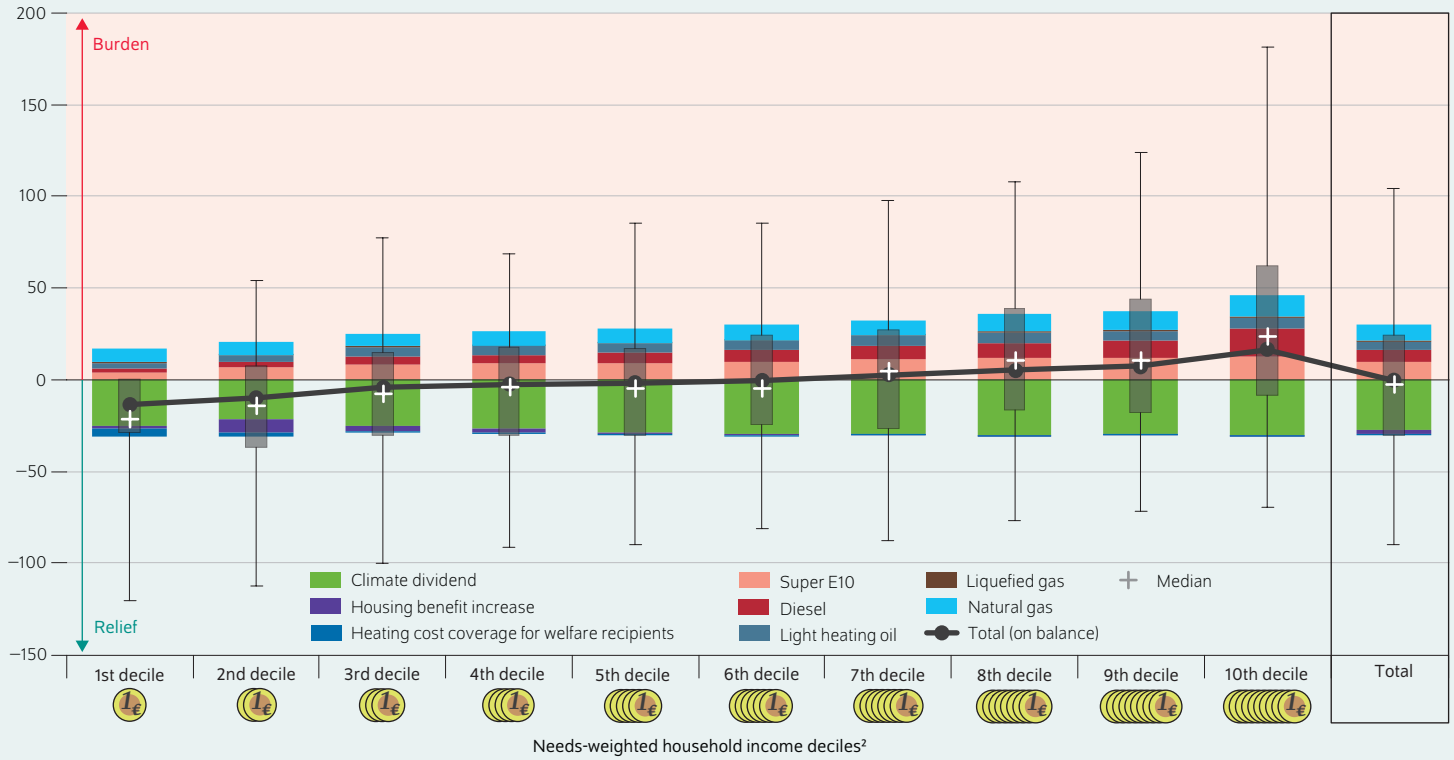
Region category	Share of households	Burden from a carbon price of 160 euros per ton[1]				Regional climate dividend
	Percent	Absolute burden in euros		Relative burden based on income		Euros/year
		Euros/year per person	Total percent	Percent of net household income	Total percent	
1. Metropolis, large city	40.9	286	79.5	1.1	77.6	279
2. Medium-sized city	17.0	359	99.9	1.4	101.4	365
3. Urban area	21.9	409	113.7	1.6	114.3	412
4. Small-town area, village area	20.2	435	121.0	1.8	125.6	452
Total	100.0	360	100.0	1.4	100.0	360

1 Plus VAT.
2 According to the Regional Statistical Spatial Type (RegioStaR) by the Federal Ministry of Transport and Digital Infrastructure.

Source: Microsimulation analyses using Socio-Economic Panel data (SOEP v37).

Figure 1

Absolute financial burden and relief for private households from carbon pricing, social transfers, and a flat-rate climate dividend[1]
In euros per month and person[2]



1 Scenario with a carbon price of 160 euros per ton (plus VAT) and a flat-rate climate dividend of 360 euros.
2 By deciles of needs-weighted net household income (private households only), needs-weighted using the new OECD scale.

Note: The shaded areas indicate the middle 50 percent of the data (25th to 75th percentile) and the vertical lines show the edges of the distribution (2.5th to 97.5th percentile). The median is the center of the distribution (50th percentile).

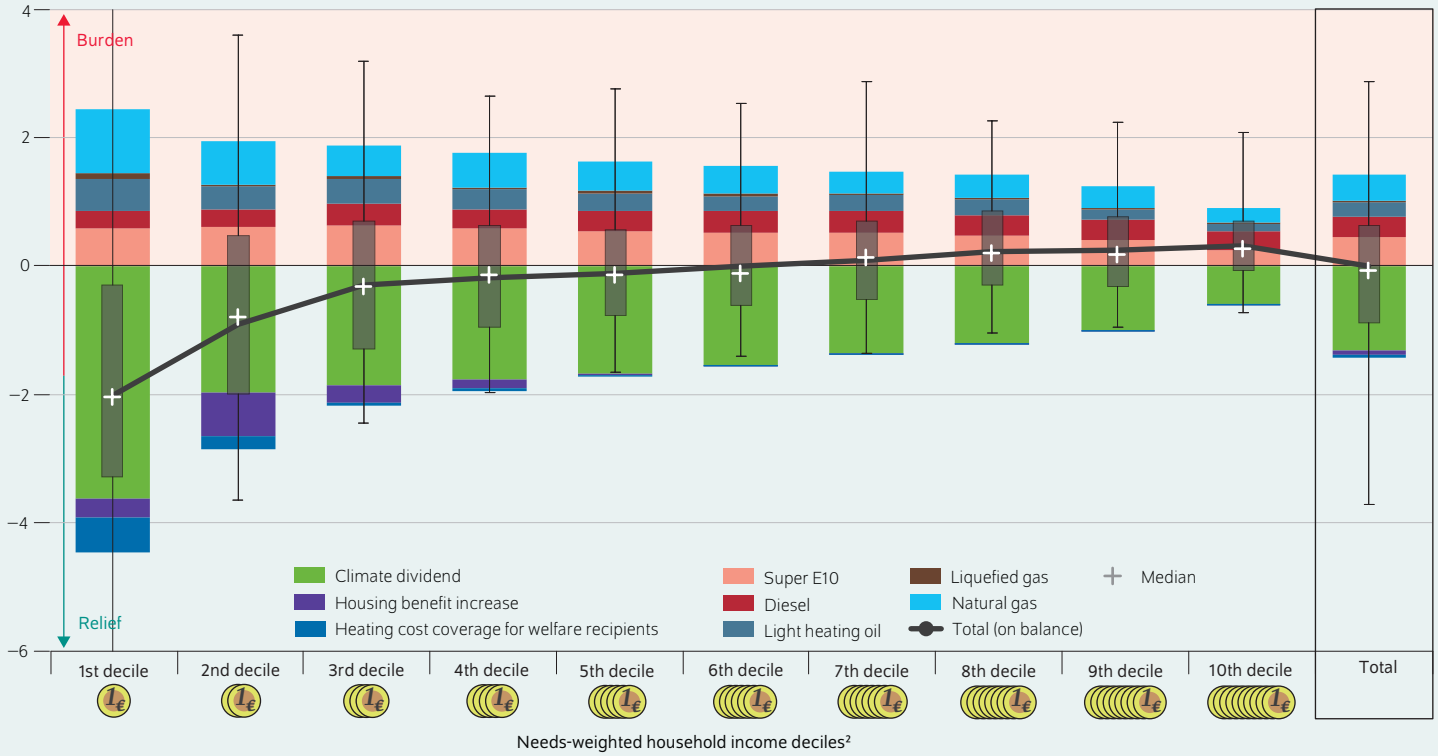
Source: Microsimulation analyses using Socio-Economic Panel data (SOEP v37).

High-income households consume significantly more fossil fuels and heating energy than poor households.

Figure 2

Absolute financial burden and relief for private households from carbon pricing, social transfers, and a flat-rate climate dividend[1]

In percent of net household income[2]



1 Scenario with a carbon price of 160 euros per ton (plus VAT) and a flat-rate climate dividend of 360 euros.
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Note: The shaded areas indicate the middle 50 percent of the data (25th to 75th percentile) and the vertical lines show the edges of the distribution (2.5th to 97.5th percentile). The median is the center of the distribution (50th percentile).

Source: Microsimulation analyses using Socio-Economic Panel data (SOEP v37).

Relative to income, the carbon price burdens low-income households much more than rich households, but the climate dividend relieves them significantly.

Trading System (EU-ETS1) are not included in the analyses. In the first analysis step, households do not adjust their consumption. Furthermore, the carbon dioxide cost share of heating energy for tenants is not accounted for in the analysis.[7]

The *absolute* burden from carbon pricing in euros per person and month increases significantly as household income increases (Figure 1). The richest ten percent of the population uses nearly three times as much fossil fuel energy as the poorest ten percent. Compared to the sixth income decile (the households in the top half of middle incomes), the richest ten percent use 1.5 times as much. This effect is particularly pronounced in the case of fossil fuels. In contrast, the increase in consumption by better-earning and high-earning households is much less pronounced for heating fuels.

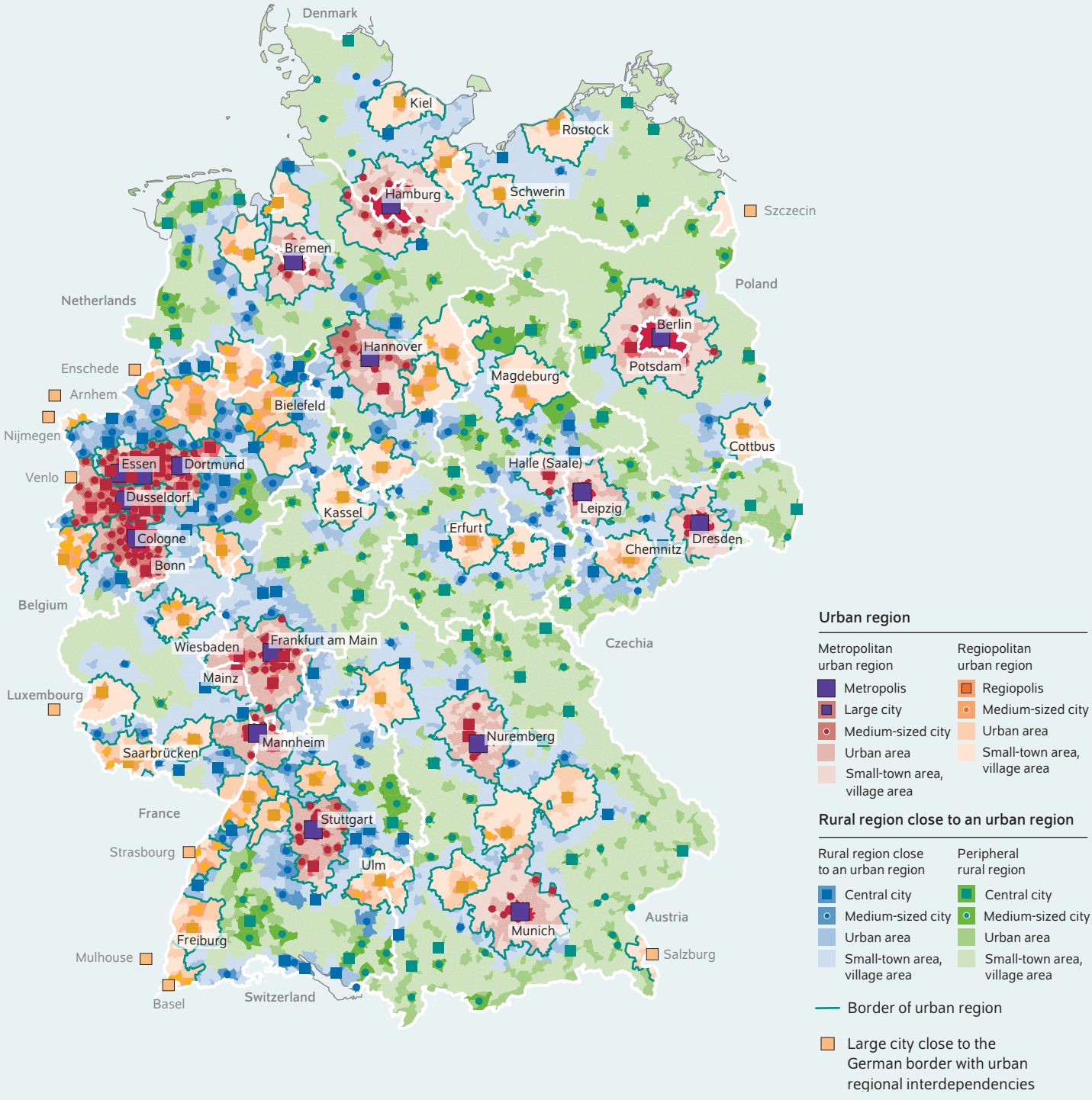
The *relative* burden and relief effects of carbon pricing and the climate dividend are expressed as a percentage of 2024 household net income, broken down by deciles of equivalence-weighted household net income (Figure 2).[8] These are significant for both the income distribution as well as the redistributive effects of tax and social transfers. As net income increases much more than the burden from

7 In doing so, the carbon pricing burden is divided between renters and landlords in a staggered model. Federal Ministry for Economics and Climate Action, *Leitfaden zur Berechnung und Aufteilung der Kohlendioxidkosten nach dem Kohlendioxidkostenaufteilungsgesetz vom 31. März 2025* (2025) (in German; available online). So far, it is unclear to what extent it will actually be implemented or to what extent it will actually reach tenants by landlords exploiting rent increases.

8 To make the income situations of households of different sizes and with different compositions comparable, a needs-adjusted per capita net income (equivalized income) according to the new OECD scale is determined for each household member. See the entry for equivalized income in the DIW Berlin Glossary (in German; available online). Then the population is divided into ten groups of equal sized based on their income (deciles).

Figure 3

Urban and rural regions of Germany



Source: Federal Ministry of Transport and Digital Infrastructure (RegioStaR).

carbon pricing across the income distribution. On average, the richest ten percent have a per capita disposable income seven times as high as the poorest ten percent. This results in the familiar picture of a regressive impact of carbon pricing on fossil and heating fuels. This burdens low-earning households relative to their income much more than high-earning households. For heating fuels (heating oil, natural gas, and liquefied gas), the regressive effect of carbon pricing is pronounced, while it is much smaller for petrol and nearly proportional for diesel.

Flat-rate per capita climate dividend relieves low-income households

The simulations first account for the coverage of welfare recipients' higher heating costs due to carbon pricing as well as the carbon and climate components of the 2021 and 2023 housing benefit reforms as relief for households.[9] In a first step, we simulate further relief in the form of a flat-rate, per capita climate dividend of 360 euros per year paid to all residents in Germany. This is calculated in such a way that the overall burden on private households is exactly balanced.

The climate dividend counteracts and reverses the regressive burden of carbon pricing. On average, low-income households benefit considerably (Figure 2). This group has their heating costs covered by the basic income scheme and they also receive the recently increased housing benefit. The effects of these policies is sizeable, which is partially offset by an equal reduction to the climate divided.[10] The increase in the housing benefit primarily relieves "top-ups" (low-income individuals also receiving the citizen's benefit) and extends into the medium income groups.

On balance, i.e., taking into account the carbon pricing burden and the relief provided by the climate dividend and social benefits, households in the bottom decile will be relieved by 2.0 percent of their net income on average, while the second decile will be relieved by 0.9 percent of their net income. The relief and burden balance each other out for middle-income earners, while the top 30 percent of households have a marginal burden of nearly 0.2 to 0.3 percent of their net income. Overall, carbon pricing in combination with a flat-rate climate dividend slightly reduces the income inequality that had been increased by the CO_2 surcharge. The resulting Gini coefficient, the standard measure of inequality, falls by 0.8 percent from 0.2958 to 0.2936.[11]

Climate dividend cannot prevent hardship cases

The analyses show the net burden is significantly spread around the mean, which is depicted here using box plots (Figures 1 and 2).[12] This spread arises due to the considerable heterogeneity of the households within the income groups in terms of energy consumption. In the two bottom income deciles, which are especially relevant to social and distributional policy, most households are relieved on balance due to higher social transfers and the climate dividend. There are also numerous "losers" in this group; 19.6 percent of households have a burden of over 0.5 percent of their net income on balance despite the climate dividend, while 14.6 percent of households have a burden of over one percent (Table 1). Such individual high burdens indicate many social hardship cases, thus requiring further aid beyond a flat-rate climate dividend, in particular for the bottom deciles. Low-earning households generally have fewer opportunities to improve the energy efficiency of their home or car, as they more frequently live in rental housing and/or are less able to finance climate-friendly housing or cars.[13] In most cases, they also find it more difficult to absorb the additional burden by saving less, liquidating assets, or taking on debt. At the same time, the burden from carbon pricing differs depending on whether households are in rural or urban areas (Figure 3).

Regionally staggered climate dividend reduces burdens in rural areas

To depict the regional dimension of the distributional effects of carbon pricing and the climate dividend, four categories of regions are formed based on the implementation of the climate bonus in Austria (Box 1). Category 1 (metropolis, large city) has the lowest burden, while Category 2 (medium-sized city) and Category 3 (urban area) have a medium and higher burden (Figure 4, Table 1). The largest burden can be found in Category 4, small-town and village areas. This could be offset by regionally staggering the climate dividend.

In a further simulation, the climate dividend is staggered using the distribution of differences in net burden from carbon pricing relative to household income (Table 1): People living in metropolises and large cities in Category 1 receive a climate dividend of 279 euros, or 77.6 percent of the federal average of 360 euros. People in medium-sized cities in Category 2 receive 365 euros, or 101.4 percent of the federal average. People living in urban areas in Category 3 receive 412 euros, while people living in small-town and village areas receive 452 euros. Compared to Austria, where rural areas receive a climate dividend that is twice as high compared to urban areas, the regional staggering is less pronounced: People living in small towns and villages receive a climate dividend that is 1.6 times higher than the dividend received by people in metropolises and big cities.

Thus, a regionally staggered climate dividend offsets the higher burden found in less urbanized and more rural areas (Figure 4). The wide distribution of the net burden within the categories of regions remains, as the box plots show. These

9 Cf. information on the German federal government website: Bundesregierung, *Mehr Wohngeld für zwei Millionen Haushalte* (2023) (in German; available online).

10 To avoid double subsidies, coverage of high heating costs via the basic income scheme and the increase in the housing benefit are offset against the climate dividend.

11 The Gini coefficient is a statistical standard measure of inequality of a distribution. It is most frequently used to determine income and wealth inequality and can take a value between 0 and 1. The higher the value between 0 and 1, the higher the measured inequality. Cf. the entry for the Gini coefficient in the DIW Berlin Glossary (in German; available online).

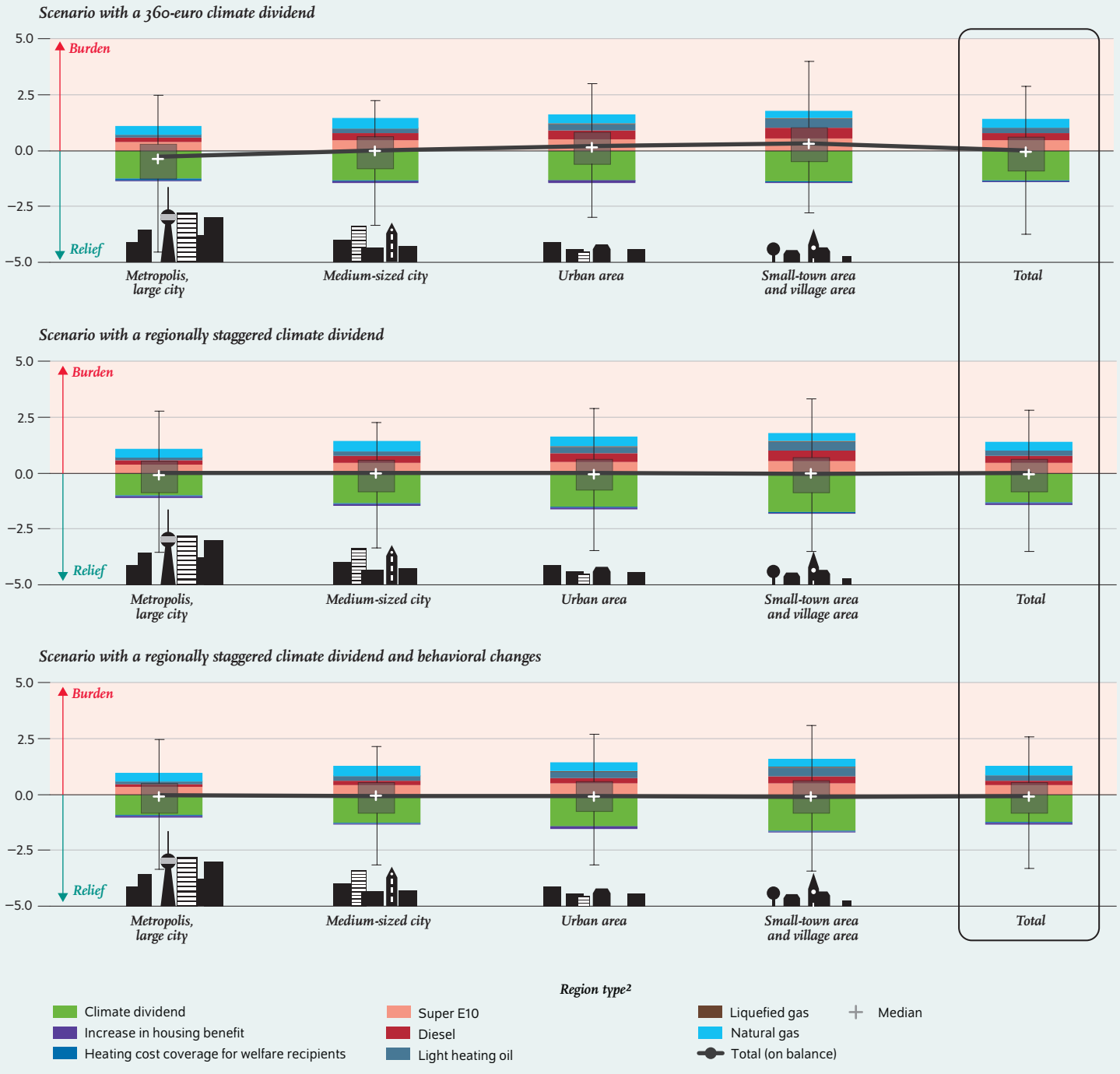
12 The box plots show the 25th percentile for the lower border and the 75th percentile for the upper border of the net burden, in line with the usual presentation in the literature (cf. the Wikipedia entry on box plots, available online). Thus, half of the respective group is within the bottom and upper borders of the box plot with their net burden. Similarly, the whiskers indicate the net burden for the 2.5th percentile and the 97.5th percentile, so that 95 percent of the respective groups are within this net burden. Furthermore, the 50th percentile is indicated, the net burden of the median household that is exactly in the middle of the distribution; half of each group has higher or lower net burdens.

13 Cf. Katja Schumacher, Christian Nissen, and Sibylle Braungardt, *Energetische Sanierung schützt Verbraucher*innen vor hohen Energiepreisen – Vorschläge für eine soziale Ausrichtung der Förderung* (Öko-Institut: 2022) (in German; available online); Öko-Institut, *Wie wohnt Deutschland? Wohnsituation, Wohnkosten und Wohnkostenbelastungen von Haushalten in Deutschland* (2022) (in German; available online); Cf. Sophie Behr et al., "Thermal retrofitting of worst performing buildings mitigates risk of high heating costs," *DIW Weekly Report* no. 19/20 (2024): 139–145 (available online).

Figure 4

Absolute financial burden and relief for private households[1] from carbon pricing, social transfers, and a flat-rate climate dividend by region

In percent of net household income



1 Scenario with a carbon price of 160 euros per ton (plus VAT).
2 According to the Regional Statistical Spatial Type (RegioStaR) by the Federal Ministry of Transport and Digital Infrastructure.

Note: The shaded areas indicate the middle 50 percent of the data (25th to 75th percentile) and the vertical lines show the edges of the distribution (2.5th to 97.5th percentile). The median is the center of the distribution (50th percentile).

Source: Microsimulation analyses using Socio-Economic Panel data (SOEP v37).

A regionally staggered climate dividend could offset the greater burden on rural areas.

Table 2

Share of households burdened and relieved from carbon pricing, social transfers, and a flat-rate or a regionally staggered climate dividend[1] by region category[2]
In percent

	Region category				Total
	1	2	3	4	
	Metropolis, large city	Medium-sized city	Urban area	Small-town areas, village areas	
Flat-rate 360-euro climate dividend per person and year					
Households relieved (increase in net household income)					
> 0.5 percent	47.0	35.7	26.9	23.8	35.3
Including the bottom 60 percent of households	61.3	48.7	16.3	10.8	47.5
Including the bottom 20 percent of households	74.8	64.7	38.7	27.0	64.6
Households burdened (reduced net household income)					
> 0.5 percent	18.0	28.0	19.7	26.0	28.6
Including the bottom 60 percent of households	15.7	23.5	20.9	26.2	25.1
Including the bottom 20 percent of households	12.1	18.4	21.6	29.6	19.6
> 1.0 percent	10.0	15.9	5.7	7.6	16.9
Including the bottom 60 percent of households	10.0	15.1	6.8	10.6	16.4
Including the bottom 20 percent of households	9.2	13.2	10.5	15.2	14.6
Regionally staggered average climate dividend of 360 euros per person and year					
Households relieved (increase in net household income)					
> 0.5 percent	36.8	34.1	11.4	10.8	35.1
Including the bottom 60 percent of households	51.0	47.0	19.1	46.1	47.8
Including the bottom 20 percent of households	67.2	63.1	41.6	34.5	63.7
Households burdened (reduced net household income)					
> 0.5 percent	25.5	30.6	16.3	20.3	28.3
Including the bottom 60 percent of households	21.9	26.3	16.5	20.8	24.4
Including the bottom 20 percent of households	16.0	20.6	17.8	25.5	19.5
> 1.0 percent	14.1	17.8	5.1	5.9	16.4
Including the bottom 60 percent of households	14.0	17.6	5.8	8.2	15.9
Including the bottom 20 percent of households	11.7	16.0	9.5	13.7	14.9
Regionally staggered average climate dividend of 337 euros per person and year (after changes in transportation behavior)					
Households relieved (increase in net household income)					
> 0.5 percent	36.5	33.9	33.7	36.0	35.2
Including the bottom 60 percent of households	50.5	45.8	45.4	46.6	47.6
Including the bottom 20 percent of households	65.8	61.5	62.9	54.6	62.8
Households burdened (reduced net household income)					
> 0.5 percent	23.8	28.3	27.2	27.9	26.4
Including the bottom 60 percent of households	20.9	25.6	24.6	26.3	23.9
Including the bottom 20 percent of households	15.9	20.3	20.4	28.9	19.6
> 1.0 percent	12.5	14.8	15.2	17.2	14.5
Including the bottom 60 percent of households	13.0	16.0	15.7	18.1	15.2
Including the bottom 20 percent of households	12.4	14.7	15.7	21.8	15.0

1 Scenario with a carbon price of 160 euros per ton (plus VAT).
2 According to the Regional Statistical Spatial Type (RegioStaR) by the Federal Ministry of Transport and Digital Infrastructure.

Source: Microsimulation analyses using Socio-Economic Panel data (SOEP v37).

result, for example, from differences in work and leisure travel, type of vehicle owned, and the type of heating, size, and energy efficiency of a person's residence. Naturally, these differences are also large within the categories of regions. In particular, the spread of the distribution of the net burden is stronger in small-town and village areas than in large cities and metropolises.[14]

This regionally staggered climate dividend does not result in any noticeable differences to the national income distribution. A regionally staggered climate dividend can balance out the average differences in burdens between the regions. Thus, it is redistributed from urban to rural areas. However, there are still many households with a higher net burden (Table 2).

With the flat-rate climate dividend, a national average of 19.6 percent of households would bear a net burden of over 0.5 percent of their net income. However, this figure is only

14 Cf. the analyses from Lukas Endres, "Verteilungswirkung der CO2-Bepreisung in den Sektoren Verkehr und Wärme mit Pro-Kopf Klimageld," *IMK Policy Brief* no. 161 (2023) (in German; available online).

Box 2

Long-term price elasticity of private household fuel demand

This Weekly Report examines the effects of significantly higher fuel prices in the long term as a result of climate policy measures on demand. The literature to date is mostly based on observed short-term and smaller price fluctuations and estimates the demand elasticities using this data.[1] One major weakness in this approach is that the price fluctuations analyzed are often not permanent and not as high as would be expected with stringent carbon pricing.

Therefore, this Weekly Report follows a different approach: In a survey experiment, a representative sample (in terms of age, gender, city size, and level of education) of 2,132 people who drive cars in Germany were surveyed on their driving behavior in different scenarios with long-term higher fuel prices. In the survey, respondents provided detailed information on their driving habits on representative routes that they currently take with their car (driving to work, shopping, driving to leisure activities).

1 Hermann Buslei, "Schätzungen der langfristigen Preiselastizitäten der Energienachfrage für Heizung und Verkehr, eine Übersicht mit Schwerpunkt Deutschland," *DIW Politikberating Kompakt* no. 194 (2023) (in German; available online).

Table

Long-term price elasticities of fuel demand

Price in euros per liter gas/diesel	Metropolises	Large and medium-sized cities	Urban areas	Small-town and village areas
1.80/1.70	−0.588	−0.539	−0.401	−0.298
1.90/1.80	−0.889	−0.677	−0.609	−0.723
2.00/1.90	−1.054	−0.821	−0.833	−0.861
2.10/2.00	−1.190	−0.907	−0.978	−0.927
2.30/2.20	−1.062	−0.856	−0.917	−0.926

Legend: A price elasticity of −0.588 means that if there is a one-percent price increase, fuel consumption in large cities falls by 0.58 percent.

Source: Authors' calculations.

Using the staircase method, where prices are gradually increased in steps, it is subsequently surveyed if and at what price level the respondents would change their transportation behavior in the long term. There were various alternatives for using their current vehicle, for example reducing how often they drive the car, switching to a more efficient car or an electric car, using public transport, using a bike, or walking, as well as other options.[2]

Based on this information, arc elasticities are calculated, the relative change in fuel consumption relative to the percentage price change:

$$E_p = \frac{\%\ Change\ in\ amount}{\%\ Change\ in\ price} = \frac{\frac{Q_1 - Q_0}{Q_0}}{\frac{P_1 - P_0}{P_0}}$$

Q_1 stands for fuel consumption and P_1 for the price of fuel after the price hike and Q_0 and P_0 for the consumption and price at the current reference price (at the time of the survey, the average price was 1.70 euros for gas and 1.60 euros for diesel). The elasticities are thus expressed relative to the status quo. The survey asks for information on the place of residence so that elasticities can be evaluated for different types of regions (Table). In contrast to the distributional analyses, the rural large cities are assigned to the medium-sized cities when calculating the elasticities, as they are more similar in terms of substitution possibilities in the transportation sector.

2 The survey can be accessed here and the pre-registration here (both accessed on June 11, 2025).

12.1 percent in metropolises and large cities and 29.6 percent in rural areas. A regionally staggered climate dividend changes the distribution in favor of rural areas, where the share of households with a net burden of over 0.5 percent of net income falls to 25.5 percent. However, this is at the expense of metropolises and large cities, where the share rises to 16.0 percent. Similarly, there are more households in rural areas that will benefit from net relief. On the national level, the number of social hardship cases that require further aid beyond the climate dividend does not change noticeably.

Higher carbon prices can lead to noticeable long-term fuel savings

Finally, this Weekly Report examines how higher carbon prices contribute to the reduction in demand for carbon-intensive products such as fuels. The behavioral effects estimated in a survey experiment (Box 2) show that higher carbon pricing in the transportation sector could lead to noticeable savings in the long term. With an increase in the carbon price to 160 euros per ton, fuel prices at gas stations would rise by around 30 cents (including VAT), a good 18 percent higher than the current price level. The effects estimated in the survey show that this could lead to a long-term decline in demand for fossil car fuels of up to 19 percent in cities and up to 16 percent in rural areas. The estimated savings in urban areas tend to be larger than in the rural areas, even if the differences are not very strong (Figure 5).[15]

15 Income effects due to the climate dividend were not taken into account here, so these are upper estimates.

It should be noted that the original transportation sector targets envisaged in the Federal Climate Action Act called for carbon savings of 65 percent compared to 1990. In light of the actual carbon reductions achieved between 1990 and 2023, which were only 22 percent in individual motorized transport,[16] the estimated savings of 16 to 19 percent are substantial but not sufficient if individualized car traffic is to make a proportional contribution to achieving climate action targets. Further accompanying carbon price measures, such as ending the use of combustion engines, could thus be necessary to achieve the desired savings.

No comparable studies on changes in heating fuels are currently available and are thus not further analyzed in this report. The transition to alternative heating fuels, however, entails a long-term planning horizon. This emphasizes the relevance of a clear long-term price signal through carbon pricing at the European level.

Behavioral effects reduce carbon pricing revenue

Behavioral effects barely have an impact on the distribution of burdens from carbon pricing. On the one hand, the fuel burden does not differ strongly between income groups. On the other, this Weekly Report assumes that the behavioral effects are the same according to income (Figure 5).[17]

It must be noted that the behavioral effects reduce carbon pricing revenue by an estimated nearly 20 percent for fuels, which is a good three billion euros including VAT in a year.[18] To continue to simulate a revenue-neutral or burden-neutral reform of private households, the climate dividend is reduced to an average of 337 euros. As a result, the share of very heavily burdened households has risen slightly overall (Table 2), especially in rural areas.

Generally, switching to alternative forms of transportation results in higher capital costs (when buying expensive electric vehicles) or disadvantages in terms of time and convenience (when using public transport), which are offset by the savings in fossil fuels. These additional effects are not included here.

Conclusion: Climate dividend an important instrument of climate policy, relief mechanism needed rapidly

With the imminent start of the EU Emissions Trading System for buildings and road transport (EU-ETS2) from 2027 and the resulting potential rise in carbon prices, the pressure to quickly establish a socially balanced relief mechanism is growing. If such relief fails to materialize, there could be considerable political resistance, especially if carbon prices are high. As a result, there is the danger that one of the key instruments of European climate policy will be undermined and its effectiveness weakened.

Long-term high carbon prices can lead to substantial emission reductions in the transportation sector. Supplementing this, a climate dividend can provide a key contribution to absorbing the financial burden from rising carbon prices, especially for low-earning households. Energy price relief, such as the elimination of the EEG surcharge and the changes to the electricity tax and network charges as planned by the federal government, could contribute only little to this relief and has less of a targeted effect.

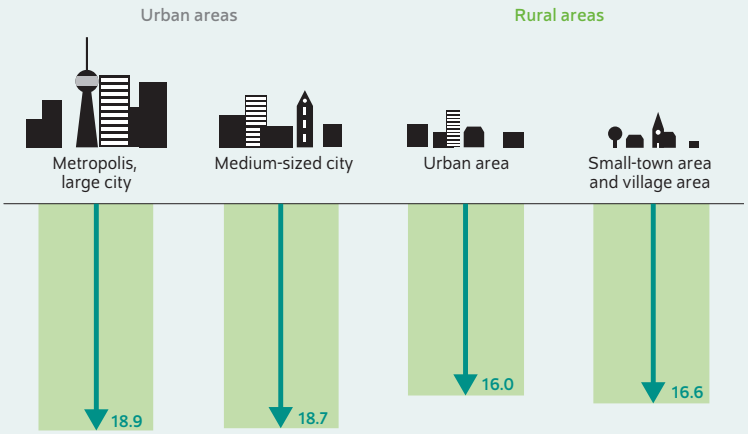
To ensure that carbon pricing is socially balanced, the climate dividend should be established as a permanent relief instrument. Unlike lowering the electricity tax, which is currently under discussion, the climate dividend can be increased more easily as carbon prices rise, is transparent, and reaches households immediately, regardless of the behavior of the electricity provider. In addition, only private households will receive the climate dividend, which makes it a more socially targeted measure.

In addition to a flat-rate climate dividend, introducing a regionally staggered climate dividend could be considered due to the fact that rural households are more reliant on cars

Figure 5

Reduction in gas demand as a result of a carbon price of 160 euros by region

In percent of current gas consumption



Notes: The higher carbon price of 160 euros increases the price of premium gas and diesel from 1.70/1.60 euros per liter to 2.00/1.90 euros per liter. Information from survey respondents is used to calculate the reduction in demand (Box 2).

Source: Authors' calculations.

People in large and medium-sized cities drive less when the carbon price is higher compared to people in rural areas.

16 UBA Zentrales System Emissionen (ZSE), *Emission von Treibhausgasen nach UNFCCC (Abkommen von Paris)* (May 2025) (in German; available online).

17 A separate estimate of the behavior effects by region and income group is not possible due to the sample size. However, the differences by income group without subdivision by region are not statistically significant.

18 In addition, there would be a disproportionately higher reduction in revenue or relief from the energy tax, including consumption in the commercial sector, particularly in the transportation sector, which is not accounted for here.

and will carry a greater heating cost burden from higher carbon prices. At the same time, rural households are less able to adjust to the transition and react somewhat less to price signals, as the calculations show. Regarding the climate-neutral transition in the transportation sector, changes are likely to be easier for people in metropolitan areas, as alternative transportation options (such as public transport or bicycles) are more readily available there. High-density construction in metropolitan areas also offers advantages in the building sector. However, the relevant landlord-tenant dilemmas and coordination problems in homeowners' associations are standing in the way.

Regionally staggering the climate dividend lowers the burden on households in rural regions and the share of social hardship cases in rural areas, as the calculations show. In contrast, the burden on households and the share of hardship cases rise in metropolises. Overall, regional staggering does not change much. However, this shifting of the burden to the benefit of rural areas can be advantageous for regional policy challenges, and in some cases for the political acceptance of carbon pricing as well. Surveys show that carbon pricing with a flat-rate climate dividend is less accepted in rural areas than in cities.[19] A regionally staggered climate dividend could also increase its acceptance in rural areas.

Furthermore, in the long term, there is the possibility of reducing the amount of the climate dividend by income. This would also be possible with a regionally staggered climate dividend and would create additional fiscal leeway. This leeway could be used to finance programs supporting the transition and to provide targeted relief to social hardship cases with high energy cost burdens, such as tenants living in particularly energy-inefficient buildings.[20] For example, thermal retrofitting could be increased in these buildings to reduce social hardship cases.[21]

19 Sandra Bohmann et al., "Mehr Klarheit schaffen: Klimageld als sozialer Ausgleich bei höheren CO2-Preisen," *DIW Wochenbericht* no. 6 (2025): 75–82 (in German; available online).

20 Bach et al., "Carbon pricing: Swift introduction of a climate dividend needed, reduce at higher incomes."

21 Cf. Öko-Institut, *Wie wohnt Deutschland?*; Behr et al., "Thermal retrofitting of worst performing buildings mitigates risk of high heating costs."

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