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STANDPUNKTE
DER CHEFVOLKSWIRTE

Green Transformation in Challenging Times

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The Chief Economists of the Savings Banks Finance Group view the green transformation - now more than ever, in an era marked by runaway inflation and macroeconomic supply-side bottlenecks - as a great opportunity to strengthen Germany's business model in a new and sustainable manner. From an economic perspective, it is important to bear these points in mind:

- The energy bottlenecks currently emerging on the markets need to be primarily tackled as a supply-side issue by economic policymakers. The volume of energy available must be expanded and all sectors - public-sector institutions, private households and companies - must be encouraged to save energy. Market-based instruments that work using the price mechanism should be utilized in this context. So the merit-order-principle should be modified.
- Given the inflation we are facing, the volume of government investment required for an effective green transformation will increase significantly, by at least 15 percent. Another factor which remains a key prerequisite for success - also in view of rising interest rates - is further stimulation of private-sector investment by households and companies, in particular. Only in this way can the green transformation be accomplished.
- Crucial to successful economic and fiscal policy in these challenging times in Germany, as in Europe in general, is to resolutely push through supply-side reforms. Demand-side measures can certainly dampen the social consequences of inflation, but they must be designed in such a way that they do not add fuel to the fire of inflation.

The point of departure

The Chief Economists of the Savings Banks Finance Group continue to see sustainable transformation as a top priority. Back in the autumn of 2021, we looked closely at the topic of investment requirements. In the meantime, however, war and inflation have shifted the goalposts: it is now imperative, with a view to 2023 and beyond, to take a deeper look at green transformation in challenging times.

Based on European Commission estimates, we ascertained in last year's study that additional annual investment requirements in Germany of 100 to 150 billion euros (Figure 1) were necessary in order for the stipulated climate targets to be achieved by 2030[1]. However, the economic, monetary and fiscal policy environment has become significantly more challenging since Russia's incursion into Ukraine. We are now therefore aiming to assess whether - and, if so, how - the ambitious climate targets can be implemented and to appraise what impact this would have on macroeconomic growth. To conclude this study, we will then put forward policy options for action.

The economic, monetary and fiscal policy environment has become significantly more challenging

Figure 1:
Investment requirements under various scenarios.
Scenarios according to European Commission estimates per sector
In billion euros per year, between 2021 and 2030

	Minimum	Maximum
Electricity network	-8	5
Power generation	3	28
Industry	2	39
Transportation	24	44
Buildings (commercial)	7	249
Buildings (households)	41	367
Total	90	732
Share Germany (~24% of emissions)	22	176
New Estimate of German investment costs (Update Chief Economists DSGV 2022)	115	172

Source: DSGV, BayernLB Research

Investment costs have also been hit by a massive wave of inflation

From an economic point of view, the most drastic upheaval of the past twelve months has undoubtedly been the massive wave of inflation that swept across industrialised nations engaged in economic recovery and which has now been aggravated by the war in Ukraine. In Germany's case, consumer-price-inflation forecasts for 2022/23 are no less than 10 percentage points higher than the predictions published a year ago.

A massive wave of inflation

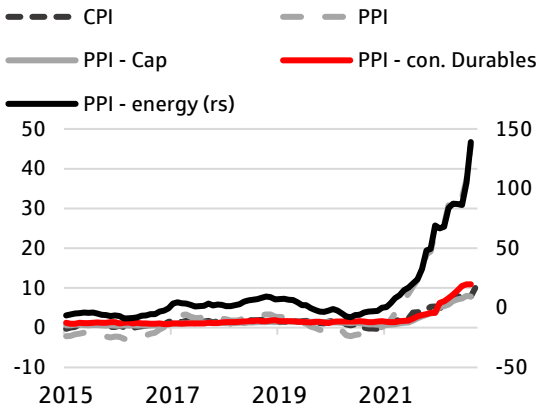
[1] cf. Statement by the Chief Economists of the Savings Banks Finance Group (2021): "Strengthening Private and Public Investment - Overcoming the Crisis Sustainably" (available online)

Inflationary pressure is expected to remain elevated right through to 2030, and central banks are going to find it a laborious process to get the inflation genie back into its bottle.

In addition, inflation at the raw-materials and producer-price levels is far more pronounced still than the unprecedented surge in consumer prices (see Fig. 2.1). At least, overall producer-price inflation (PPI) has reach new rekordlevels of over 45% higher than a year earlier, with the energy component spiking exponentially by lower but very close to 100 percent. The 7.4 percent year-on-year increase in prices for capital goods, which are of key importance for the ecological transition, seems almost moderate by comparison. However, investments in industry and transportation still account for only a minority share of the additional investment required for decarbonisation by 2030. Construction is clearly more important: in Q2 2022, construction-price indices were 17.6 percent above the previous-year level in the case of residential construction and more than 19 percent up year-on-year for commercial construction. This provisional "state of play" illustrates quite dramatically that the baseline for investment-cost estimates is quite different than was the case one year ago. The increase in inflation alone will probably inflate investment costs by an estimated 15 percent this year and if higher inflation rates would follow the next years higher investment costs of over 20 percent could not be excluded.

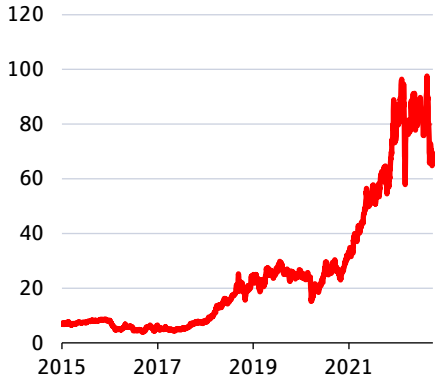
Inflation is weighing on investment costs

Figure 2.1
High inflation pressure also at producers
German price indices, in percent versus previous year



Source: Refinitiv, BayernLB Research

Figure 2.2
Price boom for emission certificates
In euros per tonne of CO_2 emitted



Source: Refinitiv, BayernLB Research

Even if the dramatic price trend is expected to ease somewhat over the next few years, it does reflect a number of structural developments that should ensure above-average inflation in the long term, as the ECB has also pointed out[2]. These include the increased incidence of climate catastrophes and extreme weather events, which are wreaking physical damage and making supply scarcer and more expensive. A second point involves higher long-term energy prices due to the increasing internalisation of the

Structural developments are also skewing inflation to the upside

[2] cf. Schnabel, Isabel (2022): "A new age of energy inflation: climateflation, fossilflation and greenflation" (available online)

environmental damage resulting from CO_2 emissions. This is symbolised by the sharply rising price of emission rights on the European Energy Exchange EEX in Leipzig (Figure 2.2)

Another aggravating factor is the price effect on other raw materials, such as metals and minerals, of investments that are indispensable for decarbonisation, since such investments are relatively raw-material-intensive. This too shifts market power and price-setting power in the direction of the commodity-exporting emerging economies and entails the risk of one-sided dependence and price shocks, as can currently be observed from Russia's de facto cessation of gas deliveries.

The Terms of Trade of the industrialised countries are deteriorating. It is to be expected that inflation will also turn out to be somewhat higher in the medium and long term than in recent decades. This effect could cause investment costs to rise by 0.3 to 0.5 percentage points per year more than previously assumed, i.e. by a total of 1.5 to 2.5 percentage points by 2030. In the case of of Germany, the costs caused by this wave of inflation would therefore add up to between 15 and 23 billion euros per year.

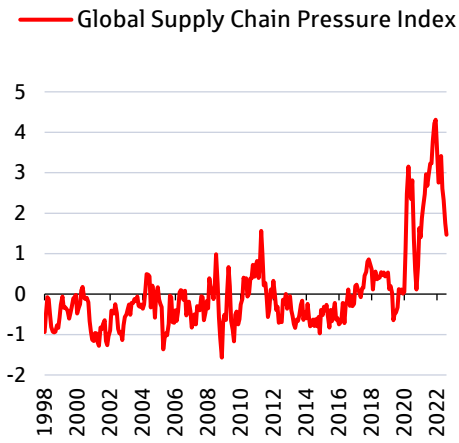
Capacity bottlenecks are provoking time-lag problems

To a large extent, the irruption of inflation we have been witnessing is attributable to global supply problems which are only slowly becoming less explosive. Although the New York Fed's Global Supply Chain Pressure Index is gradually moving down from the highs of recent months (see figure 3.1), the situation remains tense in the economic sectors most important for the implementation of Europe's ambitious decarbonisation plans. Capacity-utilisation rates are above-average both in the capital-goods industry and among producers of consumer durables such as cars, washing machines and refrigerators, which play a key role in meeting the energy needs of private households; in the latter case, the capacity utilisation is even close to historic highs (figure 3.2).

Delays in the manufacturing process lasting almost a whole year

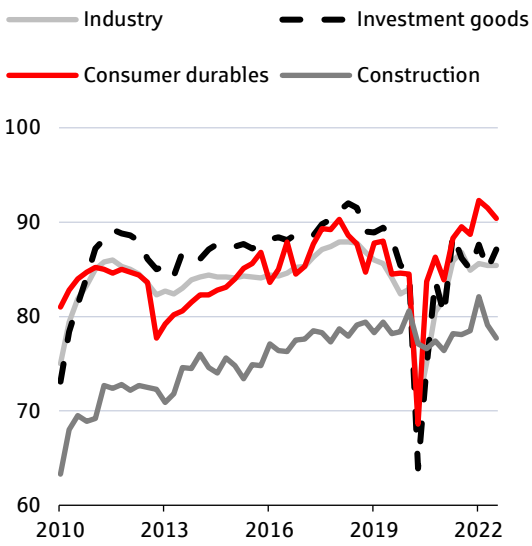
The same applies to producers of intermediate goods. This is causing delays in the production process. The average forward reach of order backlogs for capital-goods producers now extends almost a full year into the future (cut-off date: June 2022), which means that it has grown by more than two months over the past twelve-month period. This is likely to slow down the implementation of investment plans, as will the problems in the German construction sector, which are more structural in nature. The building trade (main construction industry and skilled ancillary trades), whose task it is to implement a large proportion of climate investment, has already been operating at breaking-point since 2016 and has been unable, for years now, to come close to meeting the ambitious housing construction plans launched by the government (completion of 400,000 new homes per year). As a result, no capacities are available either for a rapid expansion of renewable energy production facilities or of new pipeline networks.

Figure 3.1
Global supply bottlenecks are slowly unwinding
NY Fed Global Supply Chain Pressure Index, sb., in points



Source: Refinitiv, BayernLB Research

Figure 3.2
Germany: Capacities are being well utilised
ifo survey: capacity utilisation, sb., in percent



Source: Refinitiv, BayernLB Research

In addition to supply bottlenecks, another substantial factor driving the capacity shortages in these sectors is the labour shortage (and the shortage of skilled workers, in particular), which is now inspiring quite some concern in large parts of German industry. According to recent surveys, for example by the Munich-based ifo Institute, almost half of German companies are now being affected - which is also an all-time high. In view of the prospect of an aging workforce, from which the cohorts with the highest birth rates are set to drop out between 2025 and 2035 when they reach the standard retirement age, this problem is likely to become even more acute over time.

The shortage of (skilled) workers is a braking factor

Even though the Federal Republic has seen increased net immigration of almost half a million people per year over the last ten years, the shortage of skilled workers remains a pressing problem in view of the fact that the qualifications of many immigrants are not tailored to the German labour market, and due to bureaucratic obstacles. A points-based or skills-based immigration system has so far failed to gain the necessary political backing. Even if corresponding legislation were to be swiftly implemented, a remedy on this score would only be a possibility in the medium term.

Rising interest rates are making private-sector financing and government debt more expensive

After some hesitation, Europe's monetary policymakers have not remained idle in the face of the riptide of inflation. The ECB has discontinued net purchases under its asset-purchase programmes (PEPP, APP), has adopted significantly more aggressive rhetoric, and has recently raised its key policy rates substantially in both July and September.

With inflation currently hovering above 10 percent in the euro area, it seems clear that this is far from the end of the road as regards the rate-hiking cycle. We expect further significant policy rate hikes of at least another 125 basis points from Team Lagarde by the end of the year. Medium-term interest-rate expectations have also moved up significantly compared with the situation one year ago. We see key interest rates standing at at least 2.5 - 3.5 percent in 2023, although such a forecast is naturally fraught with a high degree of uncertainty in the current environment riven with fundamental geopolitical turbulence.

Persistently high inflation is also weighing on climate change

Ironically, such higher borrowing costs are coming at a time when financing requirements are enormous. Although governments of EMU member countries should indeed once again comply with the Maastricht criteria - the deficit criterion, in particular - from 2024 onwards, there is no question that the public sector will have to further expand its investment activity in order to reach the ambitious climate targets which have been mapped out. With government debt standing at around 66 percent of GDP at the end of 2021, Germany, unlike many other EU countries, has some fiscal leeway to do this, moreover, assuming that the Maastricht debt criterion is interpreted as flexibly as it has been to date. In addition to the regular budgets, financing through special EU funds is also possible, as has already been demonstrated with the "NextGenerationEU" reconstruction programme, whose loans and transfers are largely disbursed for specific purposes. The fact remains that the lion's share of the additional investment will inevitably fall on private households and companies, which will hardly be able to shoulder such a burden from their own resources.

The public sector needs to expand its investment activity

Tailwind from the EU

At the forefront of the latest EU initiatives to achieve climate targets is the further development of the emissions-trading system, including the roping-in of maritime transport and the counting of emissions from imported goods by means of a CO_2 border-adjustment system. What is more, this source of revenue is to be used to reduce the EU's "NextGenerationEU" debt burden. Plans are also afoot to cover emissions emanating from the building and traffic sectors by means of national certificate trading - a scheme which was launched in Germany in 2021, covering the corresponding fuels. CO_2 certificate trading is considered an efficient market-based instrument for "internalising" climatically noxious greenhouse gas emissions into the economic calculations of companies and private households.

On top of this, the EU is likewise supporting decarbonisation with the help of a far-reaching investment programme. In addition to the EU's regular seven-year budget, roughly 30 percent of whose 1.2 trillion euro total is allocated to the fight against climate change, the focus at the pan-EU level is on the "NextGenerationEU" reconstruction programme launched in 2020 in response to the pandemic.

Grants from the so-called "Reconstruction and Resilience Facility" totalling 338 billion euros will be distributed to the member states for investment measures in the period to 2026, at least 37 percent of which are obliged to be used for climate protection. The Federal Republic of Germany will receive a total of 28 billion euros of such funding, of which around 11 billion euros is to be made available to engineer the climate transition.

In June 2021, the German government decided to tighten national greenhouse gas emission reduction targets from 55 percent to 65 percent by 2030 and to achieve climate neutrality by 2045 instead of in 2050. However, according to the Federal Environment Agency's 2021 projection report, implementation of the measures adopted to date would only enable a reduction of 49 percent by 2030, which would even fall short of the less stringent EU targets. Although such estimates are fraught with a high degree of uncertainty due to the considerable forecast horizon, they underscore the extent of the fiscal-policy action which is still required.

The measures already decided on are not yet sufficient

The German government has significantly increased the scope of the climate fund

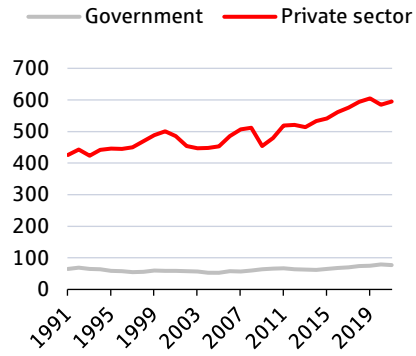
The cornerstone of the new German government's climate-policy budget plans is the further evolution of the special fund Energy and Climate Fund (EKF) into a Climate and Transformation Fund (KTF), which is expected to result in a significant increase in programme spending. With the volume amounting to 35.4 billion euros for 2023 alone, a year-on-year increase in spending of 26 percent is being envisaged. By 2026, funds totalling 177.5 billion euros are to be disbursed. However, these monies are not only earmarked for promoting the energy efficiency of buildings or decarbonisation spending in industry, but also for phasing out the EEG (Renewable Energies Act) levy and an electricity-price compensation scheme to bring relief to companies concernig the costs incurred from European emissions trading.

Although public-sector fiscal efforts on the decarbonisation front have accelerated noticeably since the onset of the coronavirus pandemic, they can only, as it were, occupy the passenger seat, with the private sector actually driving the climate transition. It is indeed true that the willingness of European companies to invest in the climate-change domain has increased in recent years; however, German companies, in particular, perceive the transition as being, for the most part, a risk to their business model, citing increased energy prices as an obstacle[3] . In order to improve their position, however, they are also signalling above-average investment activity in measures designed to enhance energy efficiency (see figure 4.2).

Private-sector investment is going to play a key role

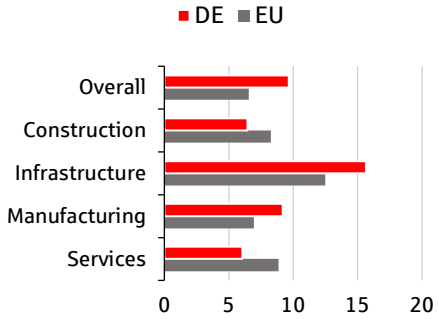
[3] cf. European Investment Bank (2022): “What is drives firms’ investment in #ClimateAction across Europe? Evidence from the 2021-2022 EIB Investment Survey” (online available)

Figure 4.1 Investment:
The state is a necessary pacemaker
Gross fixed capital formation in Germany, price-adjusted, in billion euros



Source: Destatis, BayernLB Research

Figure 4.2
German companies are reacting
to price developments
Corporate investment in energy efficiency: share of overall investment in percent, 2021 survey data



Source: Europäische Investitionsbank, EIBIS Survey 2021, BayernLB Research

In keeping with this, policymakers should aim to leverage private-sector investment ("crowding-in effect"). Especially measures geared to promoting the potential growth rate, such as investments in infrastructure, research and human capital (especially education/training), are conducive to boosting output potential, and likewise encourage private-sector investment activity. However, as desirable as crowding-in is, it should not be ignored that public-sector investment can also crowd out private-sector investment ("crowding-out effect").

Leveraging private-sector investment should be a policy objective

In addition to the direct substitution effect, debt-financed government spending, such as the NextGenerationEU programme, can act as a barrier to private-sector investment as a result of higher financing costs. In an environment of rising interest rates, this transmission channel is once again gaining in importance.

Government climate plans: A drag or a means of leverage?

When it comes to computing the aggregate effect of government spending on private-sector investment activity, empirical economic research provides mixed results. Regarding the question of whether the "crowding-out" or the "crowding-in" effect predominates, it is important to differentiate both in terms of the purpose of the spending and in terms of the macroeconomic point of departure. In the German context, a study by the economic-research institute DIW concludes that public-sector gross fixed capital formation has a positive crowding-in effect of 1.5 on private investment: in other words, one additional euro of public-sector investment boosts private-sector spending by an estimated 1.5 euros over the space of five

years[4]. The “crowding-in” effect is, moreover, influenced to a decisive extent by the macroeconomic context and is amplified in times of weak economic activity, high economic uncertainty and low capital-market interest rates.

Effects of climate-protection investment on growth are largely unexplored

As yet, the effects of climate-protection investment on macroeconomic growth are largely unexplored and can therefore only be estimated with a high degree of uncertainty. However, a point of reference here is provided by an ECB analysis on the impact of spending under the European Structural and Investment Funds (ESIF). According to this analysis, spending under the auspices of this programme generates high multiplier effects for both GDP growth and private-sector investment across all spheres (i.e. including the climate domain).[5] However, a more detailed IMF study using Slovenia as a concrete case comes to a more qualified conclusion with regard to expenditures that contribute to climate protection: according to this investigation, positive growth effects are generated, but not significant effects on private-sector investment.[6]

The pillars of government climate policy

The pillars of the medium-term climate policy referred to above - the German implementation plan for the NextGenEU package, the German Reconstruction and Resilience Fund (DARP) and the German government's Climate and Transformation Fund - largely consist of investment grants that complement private-sector investment or demand-stimulating subsidies. To be subsumed under this rubric are grants and loans for energy-efficient construction and renovation, subsidies for the purchase of more ecologically compatible cars, and research and development funding. In a report related to the "DARP" fund, researchers at DIW Berlin, in line with orthodox economic theory, estimate higher growth effects in particular for investment-oriented measures such as industrial decarbonisation, which result in productivity gains, than for consumption-oriented expenditures such as subsidies for green mobility.[7]

[4] cf. Belitz, Heike; Clemens, Marius; Gebauer, Stefan; Michelsen, Claus (2020): „Öffentliche Investitionen als Triebkraft privatwirtschaftlicher Investitionstätigkeit“, (Public-sector investment as a factor spurring private-sector investment activity), DIW Berlin: Politikberatung kompakt, No. 158, ISBN 978-3-946417-49-1, Deutsches Institut für Wirtschaftsforschung (DIW), Berlin

[5] cf. ECB Economic Bulletin, Issue 5/2022 (available online)

[6] cf. Durand, Luigi und Espinoza, Raphael A. (2021): “The Fiscal Multiplier of European Structural Investment Funds: Aggregate and Sectoral Effects with an Application to Slovenia” (April 1, 2021). IMF Working Paper No. 2021/118 (available online)

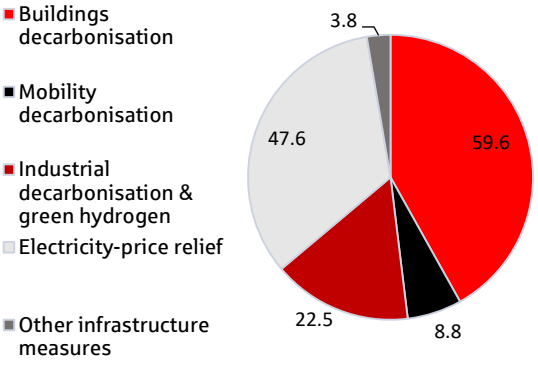
[7] DIW study on the impact of the German Reconstruction and Resilience Fund (DARP), available at https://www.bundesfinanzministerium.de/Content/DE/Standardartikel/Themen/Europa/DARP/deutscher-aufbau-und-resilienzplan.html

The measures planned by the EU and by the German government are therefore likely to have a predominantly supportive effect on private-sector investment activity. Standing in contrast to this, however, as a result of the rise in energy prices, is the growing political pressure for financial relief - such relief measures account for a significant proportion of the expenditure from the Climate and Transformation Fund, particularly in the form of the abolition of the EEG levy (cf. Figure 5.1), and diminish the incentive to invest in energy efficiency in order to achieve lower energy costs.

Together, the NextGenEU programme and the expanded "KTF" special fund represent an important tandem mobilising medium-term climate-transition endeavours in Germany. However, these vehicles can only meet a fraction of our estimated investment needs. Spurring private-sector investment is therefore essential if the existing gap is to be closed. In the period 2023-2026, the proportion of the NextGenEU programme earmarked for climate spending amounts to just over one billion euros per year, while the special fund - leaving out the monies to be spent on easing the burden resulting from electricity prices - will be making available around 32 billion euros per year. We therefore assume a private-sector investment gap of about 110 billion euros annually by 2026 (see Figure 5.2), the closing of which would necessitate a 20 percent increase in annual private-sector gross fixed capital formation. Such an increase would appear unrealistic in the short term and, despite a massive expansion of overall debt, will only be achievable by reducing other investment or consumption.

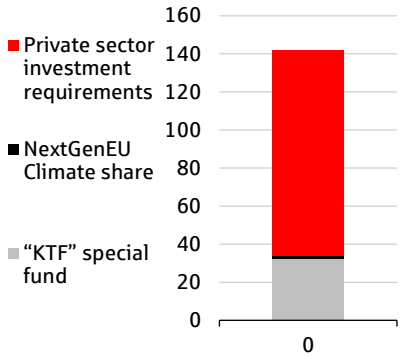
A private sector investment gap of around EUR 110 billion per year will have opened up by 2026

Figure 5.1
Main focus of NextGenEU and "KTF"
Spending priorities in billions of euros until 2026



Source: BMF, Bundesregierung, BayernLB Research

Figure 5.2
Annual investment gap of just under €110 billion.
Annual budget expenditures in € billion, 2023-2026, excluding expenditures for electricity-price relief/ EEG phase-out



Source: BMF, Bundesregierung, BayernLB Research

Distribution issues in a socially just climate revolution

For the climate revolution to prove a success, it is a necessary condition - and thus an important task for national politicians - to maintain public support for the energy turnaround and for decarbonisation. The transport turnaround and rising CO_2 prices must not only make economic sense, but also require regional and national political majorities to be built if implementation is to prove successful in the long term. Even before the sharp surge in energy prices as a result of Russia's war of aggression in Ukraine, opinion polls indicated that respondents attributed great importance to a socially just, “fair” distribution of costs.

Drumming up sustained public support for the energy transition is an important task for politicians

If private households' degree of approval for decarbonisation is looked at, significant differences emerge depending on disposable-income levels[8]. While a majority of Germans are willing to accept higher prices as a trade-off for a higher level of climate protection, the approval rate drops off significantly among lower-income groups. After all, high prices for electricity, heating, gasoline and food impose a disproportionate burden on households in the lower income segment. Without government countermeasures, there is a risk of growing inequality as a result of climate-protection measures - a risk of a widening gap between rich and poor which would potentially be socially explosive and would threaten to undermine popular approval for climate change. It is only logical, then, that distributional aspects are increasingly coming into focus, in addition to questions of investment mobilisation and its financing. If climate-protection measures were to lead to a genuine schism within society, that would certainly also entail (avoidable) negative effects on the economic trend.

Surveying the mood of the German population

Various surveys reveal a desire for "polluter justice," i.e. that a higher burden should be borne by emitters of large amounts of CO_2. In order to close this (perceived) justice gap, a large proportion of respondents wish to make companies more accountable. Although a difference in opinion between high-income and low-income households is also noted, it is primarily the absent burden for energy-intensive industries that bothers the population.[9]

Approval of the energy transition is strongly linked to income and education level

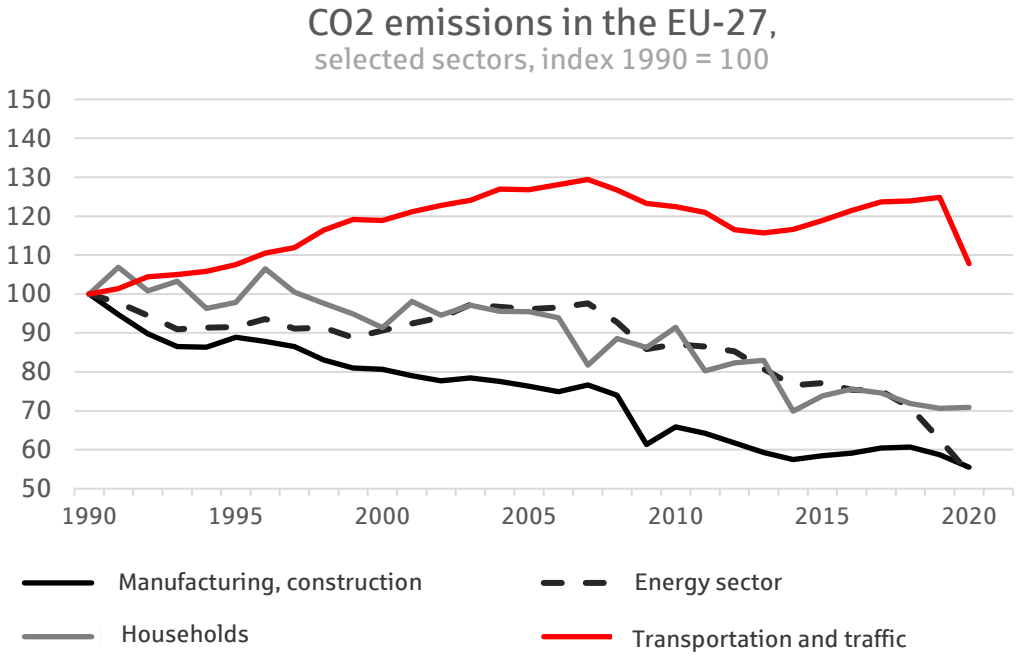
It is therefore to be welcomed that energy suppliers are also going to be co-opted into the emissions-trading scheme (EU ETS) in future as part of the European Union's "Fit for 55" package. The dicussed and now eliminated gas levy and the parallel reduction in value-added tax adopted in the summer exhibit clear shortcomings in terms of social justice, efficiency and transparency. While support for economically struggling gas suppliers is desirable, redistributive payments to profiteers from high energy prices are not economically justifiable and are more than difficult to “sell” to the population. Moreover, any distortion of scarcity-induced price signals should be avoided.

A good half of the population takes a critical view of some aspects of the energy transition ("Energiewende"). It is incumbent on politicians to continuously raise public awareness, and to point up the clear advantages of CO_2-neutral production and of a CO_2-neutral power supply. Thanks to the expansion of renewable energies, these advantages include a long-term reduction in electricity costs and the creation of future-viable new jobs.

The transport turnaround: Approval and scepticism

Where the energy industry is reducing its carbon-dioxide emissions through the expansion of renewable energies and households through modern insulation methods, emissions from transport were 25 percent higher in 2019 than in 1990. Its share in total emissions is steadily increasing: 20 percent of all greenhouse gases emitted in Germany are now almost exclusively attributable to road traffic. A large proportion of Germans have recognised this problem: there is now a great deal of support for a change in traffic policy. However, this positive underlying attitude is tempered by numerous concerns. Some see the danger of further social divisions due to rising gasoline prices, consider the costs of new infrastructure to be too high, or are afraid that disadvantages will result for Germany as a business location.

Figure 6: Trend in CO_2 emissions in selected sectors



Source: Eurostat, NORD/LB Research

There is also a great deal of scepticism about scaling back use of passenger car to zero. Large swathes of the population are aware of the need for change, but their degree of approval depends to a large extent on factors such as income and education levels. It must therefore be the task of policymakers to distribute the costs of change fairly among the population and to address citizens' concerns directly.

Revolution in social mobility: Local transport and reforms

In the long term, the mobility revolution must be based on two pillars: the replacement of the combustion engine with electricity-based and hydrogen-based propulsion systems, and a shift from “individualised” road traffic to bicycles, trains and shared mobility concepts. Since 96 percent of greenhouse gas emissions in the transport sector are caused by road traffic, a combination of technological progress and new social thought processes regarding the use of cars with conventional combustion engines is necessary. [10]This paradigm shift should be fostered with the help of appropriate instruments and incentives: people will only be willing to give up individualised CO_2-producing mobility if convincing and socially acceptable alternatives are made available on an across-the-board basis.

Affordable public transport ensures personal freedom and public consent to the transport revolution.

The centrepiece of such a transport revoltion is local transportation. For the shift in mobility to work out, quality, quantity and affordability need to be guaranteed. Germany’s “9-euro ticket,“ enabling unlimited travel in regional and local transport between June and August 2022, revealed the shortcomings, but also the opportunities, of local transportation. Despite the shortcomings, we consider a follow-on strategy such as the “49-euro ticket“ proposal embodied in the federal government’s “Relief Package III“ to be both meaningful and justified. Favourably-priced local-transportation services safeguard mobility for everyone, and therefore not only cut costs but also guarantee a key component of personal freedom. The rising prices for the use of passenger cars with conventional combustion engines cannot be fully compensated for by the switch to electric or hydrogen mobility. Inexpensive and nationwide access to local-transportation services is therefore indispensable to ensure a socially equitable transport policy. Apart from favourable prices, reliability and availability are crucial criteria for those living in rural areas, in particular.

In addition to investments in the rail network, additional capacities for trains as well as buses and bicycle infrastructure, solution strategies must therefore also be developed for more sparsely populated regions. To this end, electrically-powered shared cabs are already being tested in some regions, for example.

[10] Kasten, Peter. "Klimaschutz im Verkehrssektor: Klimaorientiertes und sozial gerechtes Marktdesign." (Climate protection in the transport sector: A climate-oriented, socially equitable market design) *Wirtschaftsdienst* 102.1 (2022): 22-28

The second pillar of the transport transition, electrified mobility, requires carefully-targeted measures to develop a socially just and climate-oriented tax and levy system for passenger cars. These reforms should be predicated on a bonus-malus system, for example through the channel of the vehicle tax. Further promotion of renewable energy sources for individual mobility and a gradual increase in the CO_2 component of the vehicle tax should have a steering effect, turning consumers away from high-emission vehicles in the medium term. In addition, the taxation of gasoline and diesel should be reformed: on a medium-term horizon, the fuel tax in its present form should give way to a general CO_2 tax. In addition, the attractiveness of vehicles powered by renewable energy needs to be optimised. One example to be mentioned here is the expansion of the electromobility charging infrastructure - especially in rural regions.

All the same, the transport revolition will presumably not prove successful without a certain degree of rethinking and without people showing a certain willingness to do without what they were once accustomed to. The available technical solutions are not sufficient, at least not so far, to accomplish the goals in this domain. This underscores the need for further innovation, for which price signals provide an important incentive.

A clear political framework instead of “knee-jerk”

Investments in decarbonisation can only be shouldered on the basis of an enormous effort by both the public and the private sectors. As the IMF recently pointed[11] out in a study, climate-protection investments are subject to special risks, among other things because of their delayed effectiveness -risks which need to be addressed by the public sector.

A transparent and rising path for CO_2 prices is required in the medium term

In September 2019, a position paper by the Chief Economists of the Savings Banks Finance Group with the focus "Introducing stringent taxation to stop climate change" emphasised. In our view, the key factor here is a transparent and rising path for the CO_2 price in the medium term. This can be determined either by issuing certificates via the market or else via the taxation channel. Since the goal is a net and not a gross reduction of CO_2, we believe that such a pricing strategy should not only target new CO_2 emissions, but should instead be symmetrical. In other words, there should be a reward for absorbing CO_2 from the atmosphere. That could be accomplished, under the certificate model, by awarding free certificates to net absorbers and, under the tax model, by granting a negative tax (subsidy). The reward would need to be designed in such a way as to achieve the CO_2 reduction target and to be revenue-neutral.

Given the low short-term elasticity of energy demand and of the persistently insufficient supply of renewable energy, the dramatic increase

[11] IMF Staff Climate Note: Ananthakrishnan Prasad ; Elena Loukoianova ; Alan Xiaochen Feng ; William Oman: “Mobilizing Private Climate Financing in Emerging Market and Developing Economies,” July 2022

A reform of the merit-or-

in fossil-fuel prices following Russia's hostile invasion of Ukraine has resulted in a massive loss of purchasing power. In order to reduce the impact of gas on other energy sources, especially electricity, a number of interventions into the complex European electricity market have already been discussed or initiated. In the case of all these interventions to mitigate the acute effects of the abrupt increase in gas prices, the medium-term effects of such political market interventions must not be ignored. This includes reforming the merit-order principle, the design of which boosts the profitability of renewables.

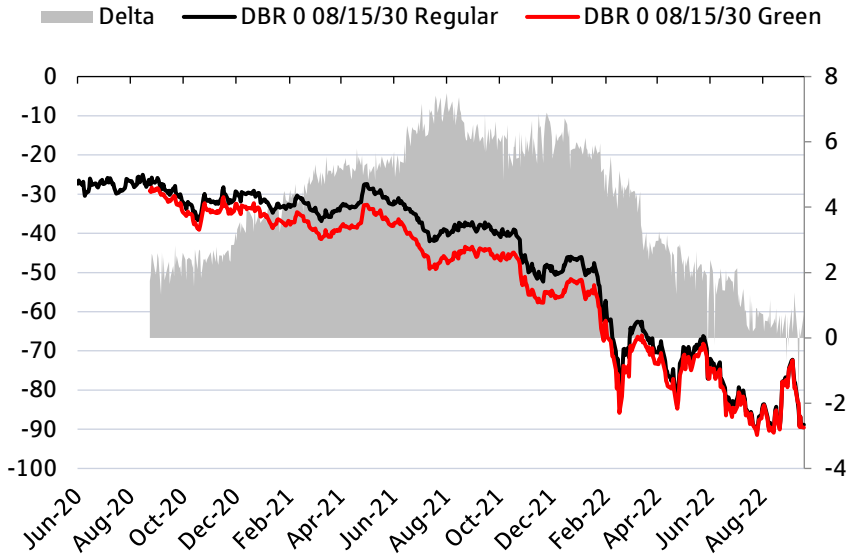
In the current environment of exorbitantly rising gas prices, consideration should be given to abolishing the principle that the highest electricity production costs apply to all electricity suppliers. The system should be modified so that the supplier with the highest marginal costs also continues to be reimbursed in full, but the remuneration of all other suppliers is based on the production costs of the second-highest supplier. This would significantly reduce the average electricity price for consumers while maintaining the incentive for renewables operating at the lowest marginal cost. In order to prevent transfers to renewables from getting out of hand over the coming years in an environment of rising CO_2 prices (and thus rising production costs for fossil fuels), a discount (based on the CO_2 price) should be introduced on the price generated on the basis of the merit-order principle.

Regardless of these measures, the erosing of purchasing power which we are witnessing will weaken the economy and, by the same token, the investment potential of companies regarding "green" investments. In order to limit the negative ramifications on the economy and, at the same time, to make a clear commitment to increasing the price of energy generation on the basis of fossil fuels in the medium term, a dynamisation of CO_2 pricing would be advantageous. With such a mechanism, additional CO_2 certificates would be put on the market in phases of significantly rising prices for gas and the like, which would then be withdrawn again in phases of falling fossil-fuel prices. Similarly, the CO_2 tax could be dynamised so that it is capable of being adjusted in opposite directions to dampen pronounced upward and downward fluctuations in fossil-fuel prices. When dynamising allowances and tax rates, however, a clear anchor point must be that prices for CO_2 increase significantly over the medium term. This is an important factor ensuring that investments in alternative-energy generation or in energy-saving measures turn out to be worthwhile. Here it is important to send clear signals.

The sharp increase in general financing costs is making it more difficult to fund "green" investments. In an uncertain environment, moreover, in which conventional investors prefer short-term performance over strategic investment decisions, the financing advantage, or “premium”, which had emerged on green bonds over their conventional counterparts (“greenium”)

has shrunk (see Figure 7).

Figure 7: ASW spread on German Federal bonds (Bunds) in bp



Source: Bloomberg, BayernLB Research

The fact remains that demand is destined to shift further and further in the direction of green investment instruments in response to the regulatory requirements already adopted for banks and financial investors. What is more, the ECB has also created a landmark precedent with its reporting requirements for the financial sector, which will put pressure on banks and companies to gather important information on the generation of climate-damaging emissions. New financial products will be developed through which the reduction of climate-damaging gases can be pushed ahead with in a targeted fashion. But although uniform standards can, and do, confer advantages, it should not be forgotten that the introduction of baroquely excessive reporting requirements for credit institutions and non-financial companies would involve a substantial extra burdens that many companies could hardly afford. Moreover, there should be a move away from imposing additional "penalties" (e.g. higher capital requirements) on the "non-green" portion of loan portfolios. Such penalties would reduce lending capacity overall - and thus, paradoxically and counterproductively, the potential for financing "green" investments.

A moderate, "middle-of-the-road "approach to regulation

Although rising interest rates and widening risk premiums are increasing the cost of financing, which is simultaneously hurting climate-protection investments, opportunities are also being unlocked as a result. In Germany in particular, the public sector could use its favourable credit rating to promote green projects through direct guarantees. In the higher interest-rate environment, what is more, the existing programmes of development banks are likely to become more attractive to investors. As with the other climate-steering instruments, however, programme simplicity should be a priority, in addition to a large measure of transparency and planning certainty. Such instruments should take their bearings by the reduction or

The interest-rate turna-round should be regarded as an opportunity

absorption of CO_2 as a uniform funding criterion. The funding contribution could then be staggered in proportion to the amount of net CO_2 reduction.

Public-sector capital for climate-friendly investments

In addition to providing favorable financing conditions for climate-friendly investments, the proposal[12] put forward by the IMF that public-sector capital should be made available for such investments appears to be forward-looking, not least in Germany's case. Such capital could be furnished by another special public fund. In principle, resources from this fund should be widely distributed and thus promote climate-friendly investments. Incidentally, it would definitely be worth considering implementing the relevant projects in the form of public-private partnerships.

Energy transition and energy poverty: Targeted support

Targeted promotion measures are crucial

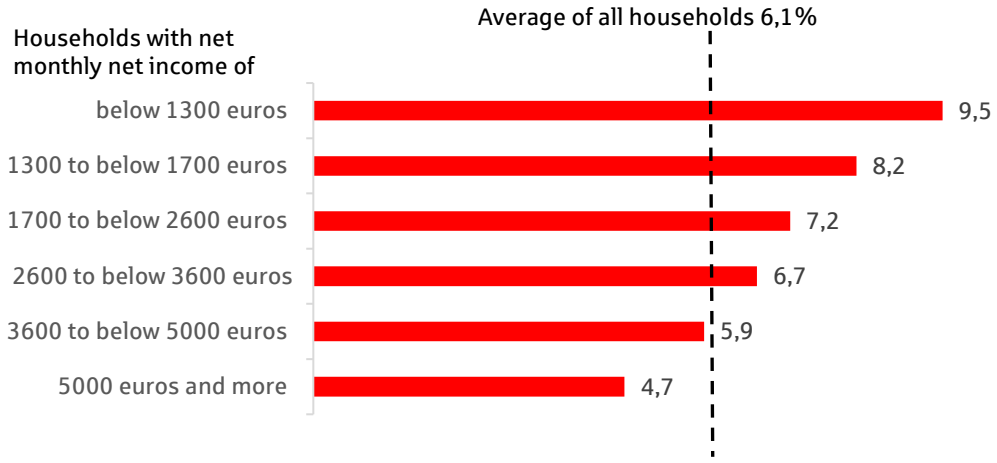
Energy consumption in the form of electricity and heating constitutes a disproportionately heavier burden for households from the lower income deciles than it does for those on high incomes. At the same time, large parts of the population, such as tenants of flats, have fewer options to protect themselves from rising prices for fossil heat generation and electricity, e.g. by renovating their flat (thermal insulation). To resolve these problems in the long term, investment in building renovation must be not only enabled but also promoted in a carefully-targeted fashion.

From an emissions perspective, the renovation of older buildings should be given preference over the promotion of new buildings. Important aspects here are affordability, and the sharing of costs between tenants and landlords. Since lower-income households, in particular, live to a disproportionate extent in rented accommodation, public-sector subsidies for renovation measures by landlords should be subject to clear regulations. Subsidies could be granted here on condition that the existing rent is guaranteed for a specific period, since the long-term increase in the value of the property benefits the landlord.[13]

[12] Public Sector Must Play Major Role in Catalyzing Private Climate Finance (online) https://blogs.imf.org/2022/08/18/public-sector-must-play-major-role-in-catalyzing-private-climate-finance/?utm_medium=email&utm_source=govdelivery

[13] Stein, Ulrike: „Klimaschutz geht nur Hand in Hand mit Sozialverträglichkeit und gesellschaftlicher Akzeptanz." No. 107. *IMK Policy Brief*, 2021.

Figure 8: Share of residential energy in consumer spending in 2020 in %



Source: Destatis, NORD/LB Research

In the short term, households particularly at risk of poverty should be protected from the repercussions of the energy crisis and, in the medium term, from the increased cost of living caused by high energy costs. Already in 2020, poorer households expended almost 10 percent of their income on electricity and heating energy (see figure 8). Given the rising prices of gas and electricity, this figure has shot up sharply during 2022. The rising cost of fossil fuels on the back of taxation of CO_2will not only make energy more expensive but also inflate the prices of food and services.

In 2022, more people in Germany were affected by "energy poverty" than ever before

A reform of the housing allowance and further relief to mitigate the impact of a sharp rise in gas prices in the autumn have already been announced. However, a long-term plan for a socially compatible energy transition should also be elaborated. Since the CO_2 levy is designed to cause fossil-energy prices to rise in the medium term, consumption-independent compensation is necessary for this transition period. In recent months, the number of households classified as "energy poor" has increased significantly.[14] In May 2022, 25.2 percent of German households spent more than 15 percent of their income on energy. These high costs can prove a secondary burden on companies: municipal utilities in Germany, for example, expect around 8 percent of customers not to be able to pay their bills over the next heating period.

A tax-based per-capita climate premium would be a simple but also suitable instrument that would provide targeted relief for people with low tax burdens and low incomes.[15] It would also be conceivable to provide a government-determined budget of low-cost energy. Prices would be capped up to the preordained limit, with regular market prices only applying at higher consumption levels. Alternatively, energy saving by private

[14] Henger, Ralph, and Maximilian Stockhausen. "Gefahr der Energiearmut wächst". (A rising risk of energy poverty) No. 55/2022. *IW-Kurzbericht*, 2022

[15] Dullien, Sebastian, and Ulrike Stein. "Sozialverträgliche CO2-Preise." (Socially compatible C02 pricing) *Wirtschaftsdienst* 102.1 (2022): 47-52

households could be financially rewarded via a voucher system. These measures would ensure affordable energy for low-income households, motivate those on all incomes to save energy, and protect energy suppliers from payment defaults.

The German government's Relief Package III is under discussion

With the third Relief Package, which was introduced into the political debate in Berlin at the beginning of September and will take effect during th of the year 2022/2023, the German government is primarily out to support macroeconomic demand. From an economic perspective, however, supply-side measures are needed above all to overcome the crisis and to contain runaway inflation. What is expedient in the current situation are agreements with countries like France, involving mutual aid over electricity or gas supplies, and having recourse to other energy sources for a longer period of time. The crucial point, now as before, is to increase the supply of energy and to encourage consumers and companies to save gas and electricity.

Relief measures will only shore up demand temporarily…

A further step could be the decoupling of gas and electricity prices envisaged by the European Commission. In doing so, though, it would be important to avoid eliminating the incentive to use renewable energy sources. It is also to be welcomed that an incentive to save is to be introduced by means of a price cap for purchases of a certain amount of electricity. The essential takeaway here is that it is supply-side measures that will help us shoulder this crisis together.

…more important are supply-side reforms aimed at boosting energy volumes

As already intimated, however, a large proportion of the German government's so-called 65 billion Euro Relief Package is intended to support overall economic demand. What this will ultimately tend to perpetuate, though, are high inflation rates. In the present situation, marked by a supply shock, it is not economically meaningful to shape fiscal policy in the same way as during the coronavirus crisis. Economic and fiscal policy will not succeed in compensating for energy-price increases across the board. It is also questionable whether the chosen approach will actually mitigate the effects on those most in need.

A re-organization of the energy system in Germany, and in Europe in general, remains a particularly vital requirement. In the process, the adjustment mechanisms of the social free market economy should be allowed free rein. In this context, the state should create the scope for a broad range of energies, which at the same time sustainably supports the transition to renewable energies. The ball remains in Germany's and Europe's court on this score.

Conclusion: The need to gain popular acceptance for reform

Combating climate change is bound to have a far-reaching influence on how we live and do business. Acceptance of this paradigm shift in policy has to be created, and has to put down deep roots in society. Putting a price on CO_2 will lead to rising prices and lower output, even though the precise impact is admittedly difficult to quantify. In this connection, the need to rectify social inequalities and the need for economic growth should not be seen as two opposite poles. Even in times of uncertain growth prospects, it is imperative to ensure fair burden sharing between households from different income groups as well as for consumers and companies. In addition, private-sector measures to reduce CO_2 emissions should be promoted or supported by the state. As things stand today, the fiscal scope for these projects, over and above EU investment programmes, is available, at least in Germany's case. The success of the climate revolution depends on the government's willingness to make more public-sector investments, which should ideally set in motion additional private-sector investment through "crowding-in" effects, and hinges above all on an auspicious framework for mobilising investments by the private sector.

Disclaimer

This position paper of the Chief Economists does not necessarily reflect the position of all institutions of the Savings Banks Finance Group.

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