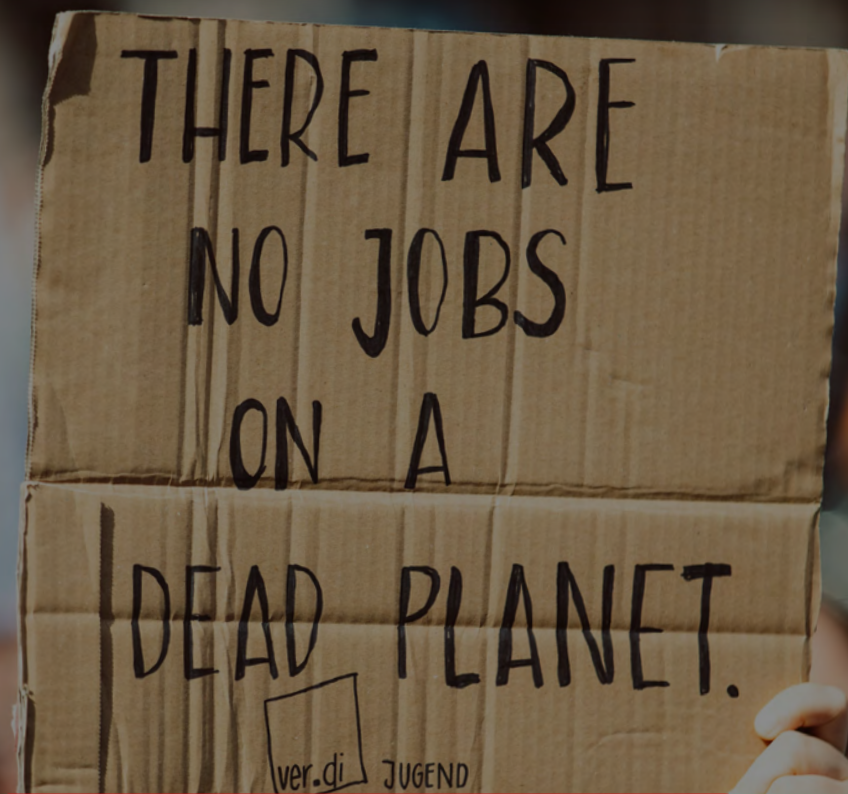


STEFFEN LEHNDORFF

# SOCIO-ECOLOGICAL TRANSFORMATION OF GERMAN INDUSTRY:

## CHALLENGES, ACTORS, STRATEGIES, AND CONFLICTS



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# Socio-Ecological Transformation of German Industry: Challenges, Actors, Strategies, and Conflicts

**Author: Steffen Lehndorff**

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## Biography

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## Preface

German manufacturing industries are at the beginning of a fundamental change. In order to be able to achieve the climate goals enshrined in the Paris agreement and in EU and German laws, a “Green and Just Transition” — or as it is called in Germany: a “socio-ecological transformation” — is needed. It requires determined and coordinated action in a multitude of technological, industrial, economic, and labour policy fields. This applies at all levels of politics: from the World Trade Organisation (WTO) and the European Union (EU) to the federal and state governments and the municipalities. Governments, in turn, need political pressure from societal actors to make progress, especially in the areas of sectoral policy and regional structural and transport policy. Next to a strong climate protection movement and environmental associations, the trade unions with their down-to-earth experience, sector-specific expertise and mobilisation power are particularly called upon here.

In the following, an overview is given of a series of studies on this topic which are the outcomes of the project “Socio-Ecological Transformation of German Industry”. Three of these studies summarise the current state of knowledge on the main trends in technology and economic policy

and present the current strategies of the relevant actors in three major industrial sectors - the chemical, steel, and automotive industries. A fourth study highlights the particularly urgent reforms in the field of labour policy in Germany, which would help to link what is necessary in terms of climate policy with what is socially necessary. Three further studies deal with the climate policy framework conditions of the industrial transformation, the significance of the hydrogen strategy and the debate over problems relating to the EU emissions trading system and the EU carbon border adjustment mechanism.

The studies were funded by the Rosa Luxemburg Foundation in cooperation with the non-profit association Arbeitsgruppe Alternative Wirtschaftspolitik and were published (in German) in 2022, available [here](#).<sup>1</sup>

The present synthesis report provides an updated overview of these studies and concludes with detailing the contentious questions faced by trade unions and other societal and political actors on the front lines of this fundamental transformation.

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<sup>1</sup> Unless additional sources are indicated in the present report, the information in what follows is based on these studies. All quotes from German sources are author’s own translation.

# 1. No more time to lose

In early 2022, the Intergovernmental Panel on Climate Change (IPCC) published two new reports warning that we have only a few years left to reach the 1.5 degrees target (IPCC 2022). The UN Environment Programme's "Emissions Gap Report" published at the end of 2023 in anticipation of the UN Climate Conference (COP 28 in Dubai) was even more urgent: if all governments fully implement their national contributions to the Paris Agreement, the temperature rise would be limited to 2.5 °C above pre-industrial levels by the end of this century, instead of the 1.5 °C targeted in Paris. However, many countries are falling short of their commitments. If the current pace continues, the temperature rise could be as high as 3 °C (UNEP 2023). Unfortunately, so far these analyses of climate researchers have not been declared a core component of the now so frequently proclaimed "turn of the times" in German and international politics. Instead, in Germany even essential elements of government spending related to climate policy are at risk of being sacrificed on the altar of balanced public budgets.

Nevertheless, climate protection is playing an increasingly important role in public consciousness. In a country like Germany, where the economic importance of the manufacturing sector is above the EU average, there is a growing interest in the topic "climate-neutral manufacturing industry". The political and media debate on this topic in recent years has focused on the costs associated with technological investment and energy requirements that must be overcome in the process of a "green transition". These challenges are of course enormous, but there is more to it than that: "Climate protection is only possible with decent work" (IG Metall 2021a). That is, the ecological transformation of manufacturing industry can only succeed as part of a *socio-ecological transformation* — or a "green and just transition". Ecological aims can only be achieved alongside social aims, and the social can only be achieved alongside the ecological.

## 1.1 THE CHALLENGES ...

The magnitude of these challenges is now largely undisputed. In the face of growing social movements and under pressure from a landmark ruling of the Federal Constitu-

tional Court which decided in 2021 that current governments also bear responsibility for the survival interests of future generations, the German Bundestag amended the Climate Protection Act shortly before the federal elections in the autumn of 2021. In it, the goal of climate neutrality is brought forward to 2045 and, in terms of greenhouse gas reduction, the interim target for 2030 has been increased to 65 percent below the 1990 level (BMU 2021). By 2030, the energy sector is to contribute to this by reducing its emissions by 61.4 percent compared to 2020; the emission savings targets for the transport sector are 43.3 percent and for the industrial sector 36.6 percent. This corresponds to a "tripling of annual reductions compared to the annual reductions of the period of the last 20 years" (Witt 2022a: 19).<sup>2</sup>

Just how ambitious these targets are can be seen from the fact that (as of 2022) around 22 percent of German greenhouse gas emissions are generated by the manufacturing and industrial sector. The iron and steel industry and the basic chemicals industry alone account for around 30 percent and 13 percent respectively (DEHSt 2023). What is particularly worrying about this is that greenhouse gas emissions from industry, except for a modest decline in the course of the ongoing crises due to Covid and the war against Ukraine, have hardly decreased since the beginning of the century. The only major decline as compared to 1990 was due to the strong deindustrialisation of eastern Germany in the 1990s (UBA 2023a).

The transport sector, in turn, is responsible for about 20 percent of all CO<sub>2</sub> emissions in Germany. Referring to the sector-specific CO<sub>2</sub>-reduction targets of the German Climate Protection Act of 2021, the Federal Environmental Agency notes that "transport is the only sector to simultaneously miss its target and record an increase in emissions compared to the previous year" (UBA 2023b). Around two thirds of these emissions are due to passenger car traffic, which has increased by almost one third in the past 30 years (measured in passenger kilometres); road freight traffic has in fact almost doubled its transport capacity in this period. Despite the increasing energy efficiency of engines, the growth in truck and individual transport and the rapidly growing market share of heavy and large passenger cars (SUVs) have prevented CO<sub>2</sub> emissions from transport (as of

2 At the time of writing the present study, the Federal Government (at the instigation of the neoliberal FDP, which is responsible for the particularly CO<sub>2</sub>-intensive transport sector) is planning an amendment to this law that is to replace the responsibility of the individual ministries for achieving sector-specific reduction targets with an overall responsibility of the government. However, the general targets are to remain untouched, including the next step: By 2030, all greenhouse gas emissions are to be reduced by 65 percent compared to 1990.

2022) from falling to any significant extent compared to 1990. The automotive industry therefore does not contribute massively to CO<sub>2</sub> emissions solely or primarily through the production process, but mainly through its products. Overall, industrial transformation is therefore about “a fundamental change in both production technologies and products” (Bendel/Haipeter 2022: 31).

Leading research institutes have worked out the technological requirements necessary to achieve their reduction targets.<sup>3</sup> The institutes not only calculate what should and could be done, but also work closely with the climate movement and have become serious advisory institutions for decision-makers in politics and business. Prognos/Öko-Institut/Wuppertal Institut (2020: 3), for example, consider the interim German target of minus 65 percent greenhouse gases by 2030 to be feasible in principle, but only under the condition of a “completely different pace in climate policy”.

A meta-study by the Wuppertal Institute (Samadi/Barthel 2020) analyses the strategies for a climate-neutral industry discussed in research. According to the study, the range of technological changes considered necessary can be assigned to three fields in particular: (1) providing climate-neutral energy sources, (2) increasing energy efficiency and (3) reducing the demand for primary materials.<sup>4</sup>

In the first field, the focus is, of course, on the massively accelerated expansion of electricity generation from renewable energies, which, as is well known, requires a considerable input from public budgets as well as regulations and has been declared a priority task by the present Ministry of Economy and Climate Protection. Technological and economic upheavals play a central role in the second and third fields. The third field of action - reducing the demand for primary materials - includes, on the one hand, so-called “resource efficiency” — circular economy and recycling are key tasks here. However, resource efficiency also means that “products are used more intensively” (ibid.: 33 f.), i.e. for example the shelf life of consumer goods is extended or the number of cars in use is reduced: “A decline in car ownership would, for example, reduce the demand for steel for the production of cars.” The third field of action therefore

holds implications that are most far-reaching both in society and in the labour market.

In a nutshell, it is more than obvious that the socio-ecological transformation of industry is a societal process that goes far beyond purely technological innovations.

## 1.2 ... ARE PARTICULARLY BIG FOR GERMANY

Among the advanced capitalist economies, Germany is one of those in which manufacturing industry continues to play a key role. This makes the socio-ecological transformation a particularly great challenge. At the same time, Germany has comparatively good opportunities to meet this challenge because of its significant potential in terms of professional expertise and skilled labour and not least because of the influence of trade unions and works councils, which remains important in parts of industry.

According to the Federal Statistical Office, before the present economic stagnation the share of the manufacturing industry in the German gross value-added kept hovering around 23 percent; only more recently it dropped to between 20 and 21 percent (BDI/BCG/IW 2023). The share of employees in manufacturing as of all dependent employees is about 18.5 percent. Of these roughly 8 million people, 464,000 work in the chemical and pharmaceutical industries, 87,000 in the steel industry and 850,000 in the automotive industry - of which 315,000 work for suppliers that will be particularly affected by the upcoming departure from the combustion engine powertrain systems. In addition, there are all those sectors that belong to the value chains of these industries - from mechanical and plant engineering to transport or IT services.

There are different forecasts for the prospects of those industries particularly affected by the transformation - especially with regard to the number of employees (see chapter 3.1). Only one thing is certain: the transformation process will be associated with considerable structural upheaval.

3 Apart from the studies of the project, cf. for the following: Agora Energiewende/Wuppertal Institut 2019; Prognos/Öko-Institut/Wuppertal Institut 2020 and 2021; Agora Energiewende/Agora Verkehrswende/Stiftung Klimaneutralität 2021; Die LINKE im Bundestag 2020 and Arbeitsgruppe Alternative Wirtschaftspolitik 2019, 2020, 2021 und 2022.

4 A fourth field under discussion is CO<sub>2</sub> capture technologies. However, the so-called CCS technology for underground storage of CO<sub>2</sub> is particularly controversial among experts. Samadi/Barthel (2020: 34) point out that carbon capture is therefore not included in the Federal Environment Agency's studies because of the associated environmental risks. However, the international debate on carbon capture and storage (CCS) and carbon capture and usage (CCU) technologies is gaining momentum.

More recently these uncertainties have given rise to public debates about a possible “deindustrialisation” of Germany. This term is of course exaggerated, but even a decline in the share of industry in gross value added to the levels of France or the UK, for example, would be a dramatic change for the German economy.<sup>5</sup> The more specific concerns raised in this regard, particularly by representatives of companies and business associations, are not entirely unfounded, but they fall short of the mark. Germany’s economic weakness since the beginning of the 2020s has a variety of causes. Currently, these include the decline in demand in key export markets, the inflation-induced weakness of the domestic market, high energy prices (which are particularly worrying for energy-intensive industries) and given the Inflation Reduction Act, the resulting increase in the attractiveness of investment in the USA.

However, there are also more fundamental causes such as infrastructure that has been damaged by decades of spending cuts, an education system that is dramatically inefficient and socially divisive, an accelerated shortage of skilled labour as a result, a state apparatus that is inefficient in many areas and, last but not least, the lack of a strategically oriented fiscal policy. A transformation strategy in Germany must therefore combine the strengthening of the domestic market (primarily through the expansion and improvement of public infrastructure) with the massive promotion of climate-friendly industrial production in Germany and the EU (Hickel 2023; for a short analysis in English cf. Bofinger 2023).

If this challenge is measured against the policies of German governments, the concerns of many industrial workers about keeping their jobs are all too obvious. Without the credible offer of realisable, encouraging positive alternatives, the danger of such fears being instrumentalised by the far right is obvious and can already be experienced in many regions. In Germany, a particular background to this is social inequality and a dualisation of the labour market that have grown since the 1990s and the so-called “labour market reforms” of the early 2000s, which offer extreme right-wing and right-wing populist parties many points of contact (Erben/Bieling 2020). On this objectively uncertain and subjectively unsettling ground, the necessary climate protection measures in industry and transport must be implemented within a very short period of time. Klaus Dörre

(2020: 67) therefore rightly describes “the enforcement of ecological sustainability as a problem of equality and justice”. Trade unions and their workplace actors have a difficult key role to play in meeting this challenge.

The terms “socio-ecological transformation” — as well as “green transition” or “just transition” — used in many cases (and also in the studies presented here) is therefore aimed at the central idea highlighted above: the ecological can only be realised in conjunction with the social, just as conversely the social cannot work without the ecological. The German and even more so the worldwide environmental catastrophes in the past few years with their manifold visible threats to human life have foreshadowed what will happen on a much larger scale if this connection is not taken seriously.

Critically, it could be objected that many analyses only focus on individual countries although climate change is a global challenge. Of course, there can be no doubt that a socio-ecological transformation of industry in individual countries such as Germany - as well as the EU - cannot work without binding international agreements, bold reforms of the international trading system and massive support for sustainable development in the emerging economies in the so-called Global South (most of which are the least responsible but most affected by the climate crisis). Nevertheless, a focus on an individual country such as Germany makes sense especially in the context of industrial restructuring. For if it is considered important for a highly industrialised country to use all its economic and political weight at European and international level for resolute climate protection measures (what has not always been the case so far, to say the least), then everything necessary must be done at home.

In this respect, the political outlook in Germany has become extremely unclear since the end of 2023. In November 2023, the Federal Constitutional Court declared the credit-based parts of a separate federal “Climate and Transformation” investment fund (totalling 60 billion euros) unconstitutional. The underlying problem is the so-called “debt brake” in the German constitution (which is much more rigid than the budget rules of the Stability and Growth Pact at EU level). The debt brake has proven to be

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5 Some may see this as an opportunity to reduce the export dependency of Germany’s economic development. As justified as this intention is, its link to the goal of decarbonising industry as quickly as possible is problematic. Assuming consistent market regulation in Germany and the EU to reduce CO<sub>2</sub> emissions, from a global economic perspective, lower production of climate-friendly industrial goods in Germany or other EU countries would lead to larger market shares for climate-damaging industrial goods produced in regions with lower environmental standards in the short to medium term, i.e. without a fundamental change in consumer habits in Germany and abroad.

a major obstacle to all kinds of public investment in economic and social infrastructure and will be a major hurdle for the future infrastructure and industrial policies needed for the transformation of industry (Bofinger 2023). To circumvent these restrictions, special budgets have been created, justified with “emergency situations” such as the Covid crisis. The attempt to extend these special budgets and switch them to promoting ecological change has now been stopped by the Constitutional Court.<sup>6</sup> At the time of writing the present study it is unclear whether the Social Democratic-Green-Liberal coalition government will survive this blow. And regardless of its survival, it cannot be assumed that the massive public funds needed for the Green Transition will be available. The phrase used above - “everything necessary must be done at home” - describes an increasingly dramatic challenge rather than an actual strategy being pursued (I will return to this problem several times below).

### 1.3 THE SOCIO-ECOLOGICAL TRANSFORMATION IS A PROCESS OF ENTERING NEW TERRITORY

Those who strive for a “green, resource-efficient, climate-compatible and socially sustainable reindustrialisation” (Henricke et al. 2019: 33) — rather than deindustrialisation — cannot focus solely on the decarbonisation of production processes and products. It is not only the energy and resource efficiency of production that is under scrutiny, but also the energy and resource efficiency of products and *their use*. The quantitative scope of material goods — and here many eyes are directed first to the transport sector — must therefore not be inflated further and further by an unbridled drive for growth inherent in the valorisation of capital, but must ultimately even be reduced. In this context, potential “rebound effects” of increasing technological efficiency, if accompanied by cost and price reductions, must also be considered: “Unchecked growth, lifestyle and rebound effects can cancel out a large part of the technologically achievable energy-saving potential” (ibid.: 115).

As is well known, the problem addressed here is the starting point of an extensive debate on “degrowth” and “post-

growth”. Ulrich Brand (2021: 54) rightly points out that the latter is not about “the decline of GDP per se”, but in essence “about a different understanding of individual and societal prosperity”. In fact, the environmental and climate-relevant problem is not the gross domestic product (GDP), which as an indicator of prosperity has been critically discussed in non-neoclassical economics for a long time anyway, but the consumption of nature. For the time being, it remains a controversial question “to what extent growth and resource consumption can be decoupled” (Troost 2021: 2). However, since saving the climate will not tolerate any delay, it is now imperative to explore every conceivable possibility and, in doing so, to explore “absolutely new territory in terms of regulation and governance” (Henricke et al. 2019: 113).

From a trade union point of view, important steps in this direction can be — by way of example — bold product market regulations, sectoral and regional transformation councils, extended co-determination rights of employee representatives, and last but not least: new possibilities for public lenders to exert influence and to develop alternative forms of ownership in order to bring longer-term social necessities to bear as counterweights to short-term shareholder interests (cf. also Bendel/Haipeter 2022; I will come back to this in chapter 4.3). In the search for new forms of ownership, however, it will be important to keep Wiethold’s (2019: 62) question in mind, to what extent “the interests of employees or public enterprises [coincide] with societal interests”. And what Hensche (2021: 83) rightly reminds us should not be forgotten in this context: “Debates about the future must not exclude the nature of public property in particular. The privatisation initiatives were not only successful because the state and municipalities had been beaten to the punch by austerity budgets; rather, some public enterprises had gambled away trust due to bureaucratic structures, felt, and authoritarian dealings with the citizens.” What is more, the devastating environmental damages that were also caused in the countries of “state socialism” in the 20th century (and are still particularly relevant in the countries concerned today) are a reminder that overcoming the capitalist logic of profit with the help of public property is likely to be at best a necessary, but in no way a sufficient condition for overcoming the climate crisis.

<sup>6</sup> For an information in English see <https://www.euractiv.com/section/economy-jobs/news/use-of-e60bn-covid-debt-for-climate-fund-unlawful-german-top-court-rules/>. The ruling was based on a complaint by the conservative CDU. The neo-liberal FDP, responsible for the finance ministry in the government coalition with the SPD and the Greens, has from the beginning been equally critical of this “circumvention” of the debt brake. However, in the coalition agreement of 2021 the Liberals had accepted this kind of separate investment budget as an inevitable compromise. Given the ruling of the Court, however, the FDP has returned to its basic rejection of any further derogation from the debt brake and is demanding, among other things, massive cuts in social expenditures. The only circumvention of the debt brake that is accepted by the Christian-Democratic and Liberal parties is a special budget for military spending which was enshrined in the constitution after the Russian invasion of Ukraine.



Against this background, it will be crucial to gather and analyse practical experience with first steps and experiments in the uncharted territory of transformation. The time horizon must also be considered: “Today, far-reaching decisions are being made about the goals of transformation and new technology paths without all the parameters of this upheaval being known yet” (Bosch 2022: 5). The socio-ecological transformation of industry can therefore only succeed if it is understood as a *process*: The goal is set, but the path to get there is full of uncertainties. This process must be initiated now, under the current conditions, through concrete, rapid and determined reform steps. These reform measures will have to be reviewed and most probably expanded in the further course, but they will not lose their relevance as launch pads or stepping stones in this process.

It is exactly on the initiation of this process that the studies of the project presented here are focussed, and the present overview follows this pragmatic, action-oriented approach. This approach does not close doors to more far-reaching perspectives of transformation — it rather opens doors

(and further reveals them). It is about practical steps “that, measured against sustainability goals, immediately bring about improvements and yet approach system boundaries” (Dörre 2021: 239) — or at least may approach them. For only if a societal process of socio-ecological transformation is set in motion, can the need for more far-reaching forms of “taming” the market forces (Klein 2022) be placed on the political agenda more convincingly as a *practically experienced necessity* for society at large.

In the following chapters, I first summarise the economic and technological transformation strategies and measures in the three sectors considered here (Chapter 2). This is followed by a focus on labour policy as the social cornerstone of socio-ecological transformation (Chapter 3). Against this background, the strategies of the relevant actors are examined - with particular attention to the challenges for trade union action (Chapter 4). The present report concludes with a summary of the most important “building sites”, as I call them, of a socio-ecological transformation of German industry (Chapter 5).

## 2. The transformation begins: The state of play in three key industries

First steps have been taken so far in entering the new territory of socio-ecological transformation of manufacturing industries. The strategies of important actors and the measures initiated to realise them still fall well short of what the relevant research institutes consider necessary. But a lot has begun to move. Governments at various levels, for all their hesitancy and inconsistency, are setting the most important benchmarks for the economy.

### 2.1 DRIVERS AND DRIVEN: THE CONSTELLATION OF ACTORS

Governments are drivers in climate policy, but at the same time and initially they are themselves driven. They react to societal trends and changes in public opinion. For decades, the warnings of climate research were at best taken note of, and valuable time for stopping further heating of the earth’s atmosphere was wasted. It was only the increased awareness of the impending climate catastrophe among broader sections of the public in the past ten years and the grassroots movements such as Fridays for Future that strengthened this trend that led to more and more govern-

ments not only announcing declarations of intent, but also entering into international commitments. The Paris Climate Agreement of 2015 is probably the most important milestone so far.

In connection - or interaction - with this development, the increasing public attention to climate change is expressed in two further areas that are of greatest importance for companies: on the one hand, the expectations of consumers and the resulting market opportunities and potential competitive advantages, and on the other hand, private investors who are increasingly oriented towards sustainability criteria. Particularly important here are the investment strategies of large capital-issuing institutions such as insurance companies and investment funds, which want to avoid stranded assets in their portfolios (Haas/Unmüßig 2020). If, for example, environmentally harmful products come into public disrepute and their manufacturers are considered a risky capital investment, then “greenwashing” can reach its limits, so that the product and production strategies of industrial companies actually come under pressure. All these factors must be seen in context, they interact and can reinforce each other.

Against this backdrop, the gradual shift by governments towards practical measures that go beyond declarations of intent has led to politically set benchmarks and framework conditions that have prompted many companies and their interest groups in the three sectors considered here to adopt new strategies. In some cases, they are actually taking serious steps to change their strategies - but the process itself remains highly contradictory and controversial.

This can be observed in the policy of CO<sub>2</sub> pricing. The central role here is played by the EU Emissions Trading System for the energy sector and energy-intensive industries (EU-ETS; cf. the studies by Fritz (2022) and Witt (2022a) on its history, mode of operation and gradual extension; see also Arabadjieva/Akgüc (2021) for a short overview in English), which was already introduced in 2005. Due to the initially high upper limits of the permissible emission quantities under the EU-ETS, CO<sub>2</sub> prices remained very low until a few years ago. Under these conditions, the system could not have the intended steering effect on the quantities of CO<sub>2</sub> emitted. There was no incentive for investment in sustainability; instead, investments continued to be made in coal-fired power plants, for example. What is more, until recently energy-intensive industries were able to “cover around 95 percent of their emissions with free certificates” (Fritz 2022: 10). It is only in recent years that several EU-ETS reforms have triggered CO<sub>2</sub> price increases. As a result, for example, older lignite power plants in particular have become uneconomical. The most determined legislation so far has been the “Fit for 55” package of the EU in 2023 which includes a series of more far-reaching directives and regulations (EU Commission 2023).

The hesitancy of the approach of the EU Commission and the EU member states over a period of about 15 years is closely related to the influence of the business associations concerned on the EU Commission and — at least as important — on national governments. This lobbying is one side of the coin. But the other side is the gradual reorientation of these associations and their most important member companies.

This process can be observed very well in the example of the German Chemical Industry Association (VCI). Until a few years ago, this business association held up the flag of a vol-

untary (though not necessarily unambitious) “self-commitment”, which still plays a central role in other sectors such as the food industry. The aim of the VCI was “to stop political regulations on climate protection that went beyond the voluntary commitment of the companies if possible or, if they could not be prevented, to minimise their regulatory content” (Bendel/Haipeter 2022: 19). Until the 2000s, the focus was on preventing CO<sub>2</sub> pricing — which was initially successful in Germany but not at EU level. There, however, the voluntary commitment could then be brought into the negotiations on the rules of emissions trading with the aim of making the emissions leeway within the EU-ETS as large as possible and the costs as low as possible. However, the Paris Climate Agreement then made the limits of this strategy clear. Since then, the VCI has no longer been primarily concerned with avoiding political regulations, but rather with formulating conditions to be created by the state for the implementation of regulations that maintain the competitiveness of the German chemical industry. Conceptual cornerstones were provided by a “Roadmap Chemistry 2050” commissioned by the VCI, which could also be used as an input for the development of joint positions with the trade union IG BCE and with environmental associations.<sup>7</sup>

In comparison, in the automotive industry the reorientation has been less clear and consensual. In reducing CO<sub>2</sub> emissions, the transport sector lags behind all other sectors. There are increasingly heavier and larger cars, which are the most profitable for the car manufacturers. Continuing to pursue this business model for as long as possible has been at the centre of the efforts of the car manufacturers and their interest group VDA (Association of Automobile Manufacturers). The German car lobby has also been successful at the EU level: the EU’s so-called fleet consumption targets, whose violation results in fines for the manufacturers, are still so SUV-friendly that the hoped-for steering effects in the direction of CO<sub>2</sub> reduction have so far failed to materialise (Pardi 2022). At best, massive purchase incentives for vehicles with electric and hybrid powertrain systems have a steering effect, whereby large and heavy vehicles are in fact favoured here as well. More recently, the efforts of the VDA — with massive support from the German Ministry of Transport — have been primarily aimed at leaving loopholes for combustion engines running with so-called “E-Fuels” after their attempts to delay the ban on the approval of internal combustion engines, planned for 2035 by the EU Commission, proved unsuccessful.<sup>8</sup>

7 On trade union strategies in the chemical, steel and automotive industries cf. chapter 4.2.

8 These attempts, advertised under the label of “technological openness”, are to preserve a perspective for the internal combustion engine in the future through the use of synthetic fuels (which are extremely energy-intensive to produce) - not least for particularly noisy and profitable passenger cars like Porsche or Ferrari. This orientation towards “technology openness” has also found its way into the coalition agreement of the present Federal Government and is defended by the Transport Ministry

However, since tighter regulations in the EU are ultimately unavoidable and the requirements in other regions of the world (such as China or California) must also be taken into account, the major companies in the automotive industry are now concentrating powerfully on ramping up e-mobility. However, because they started much too late and concentrated on the high-price market segment, which continues to be privileged within the framework of the EU CO<sub>2</sub> emissions regulation for passenger cars, they are now coming under massive competitive pressure from Chinese manufacturers in the lower and mid-level vehicle classes. Overall, in the core sector of German industry, “the paths of transformation run between continuity and rupture” (Blöcker 2022b).

The interplay between the actors can therefore be summarised somewhat simplistically as follows: the auctioning of CO<sub>2</sub> emission rights, which is often referred to as the “centrepiece” of state regulation, has only begun to have a direct steering effect over the past few years and so far only - but at least - in the energy sector. In energy-intensive industries, such an immediate effect has so far failed to materialise due to the large volume of free certificates. Nevertheless, there is a steering effect, namely in anticipation of price developments to be expected in the future due to the planned tighter regulations in emissions trading and - for the automotive industry - in the expectation of an end date for the registration of combustion-engine passenger cars. Even though some interest groups are making intensive efforts to weaken and financially cushion such regulations, everyone knows that there is basically no way around them. In particular, the EU’s policy, which is primarily - though not exclusively - focused on market regulation, is thus definitely showing its first effects. But how consistently this policy is pushed forward in the next few years depends above all on public pressure: both on the EU and the governments of its member states as well as on large companies and their interest groups, which in turn have to keep an eye on both future regulations and future developments in their sales markets. And if the climate protection targets enshrined in law are to be achieved, this pressure will have to increase considerably.

In the following, an overview is given of the technological upheavals initiated in the steel and chemical industries, and then in the automotive industry, as well as the associated demands on economic and industrial policy, before chapter 3. summarises the accompanying challenges for labour policy.

## 2.2 THE INITIATION OF TECHNOLOGICAL AND ECONOMIC UPHEAVAL IN THE CHEMICAL AND STEEL INDUSTRIES

As mentioned above, these two particularly energy-intensive industries must make the greatest contributions to reducing CO<sub>2</sub> emissions by 2030. In the steel industry this primarily concerns the renewal of production processes, in the chemical industry both production technologies and products. That is, both the energy input and the material processes themselves are on the agenda.

Bendel and Haipeter (2022) summarise the scientific analyses which show that the required CO<sub>2</sub> reduction in the *chemical industry* is technologically possible in principle. For example, they refer to Agora Energiewende/Wuppertal Institute (2019) which describes CO<sub>2</sub>-neutral alternatives for three of the most CO<sub>2</sub>-intensive production processes in basic chemicals. “Based on the proposed technologies, the authors estimate the potential for CO<sub>2</sub> reductions in the chemical industry to be high. These reductions could already be achieved by 2030” (Bendel/Haipeter 2022: 12). In another analysis - the “Roadmap Chemistry 2050” - the path to greenhouse gas neutrality in the chemical industry by 2050 is described on the basis of an even broader spectrum of technological innovations. Concrete projects for the development of new processes are being developed, for example, within the framework of a cross-industry “dialogue platform” (“Chemistry4Climate”) funded by the Federal Environment Ministry. The VCI business association also organises networks through which, among other things, experience in increasing energy efficiency is exchanged and disseminated within the industry. Also important are pilot projects in which decarbonisation in different sectors is linked (“sector coupling” - see more on this below). In the steel industry, for example, a process is being tested to capture CO<sub>2</sub> in manufacturing processes, which can then be used as a raw material in plastics production in the chemical industry.

In many of these technological innovations the production and use of hydrogen plays a key role. This applies in particular to the steel industry where — next to a rapidly increasing energy efficiency — the turn to so-called “green hydrogen” and the building of the necessary infrastructure is crucial (for technical details and practical examples of initial pilot plants at large steel manufacturers, see Blöcker 2022a). However, the production and use of hydrogen is extremely electricity intensive. For example, the “Roadmap Chemistry 2050” emphasises that the chemical industry alone will need more green electricity per year from 2040

onwards than the total current annual electricity consumption in Germany. Only if a massive acceleration of the expansion of green electricity succeeds will the switch to hydrogen actually lead to CO<sub>2</sub> savings in the chemical and steel industries. What is more, a high import share of green hydrogen will be needed, and the production capacities for it will have to be created in Europe and on other continents (on this problem, see Witt 2022b).

In Table 1 some of the key technologies for both industries are listed that are considered both necessary and possible by the relevant research institutes. In addition, the earliest possible times at which these technologies could in principle be available are mentioned. Note that what is referred to here as “possible technical availability” does not mean that these key technologies will yet be fully deployable in the timeframes indicated. And it implicitly draws attention to the fact that a number of prerequisites must be in place for this to happen (basic prerequisites for the success of these technological overhauls, in which government action plays a key role, will be summarised in Chapter 5).

The investment in the new industrial facilities is associated with an economic and industrial policy effort that must be tackled immediately. As stated by Agora Energiewende/Wuppertal Institut (2019: 12): “In order to achieve climate neutrality in industry by 2050, all investments made from now on must already be climate neutral or at least provide for the possibility of retrofitting to CO<sub>2</sub>-free production. If investments are made again in conventional technologies in the coming investment cycle, there is a threat of stranded assets, i.e. the premature shutdown of plants that are still functional, with corresponding entrepreneurial and economic losses.”

Table 1: Key technologies for reducing greenhouse gas emissions in the steel and chemical industries (selection)

<b>Steel</b>	<b>Key technology</b>	<b>Possible technical availability</b>
	Direct reduction with hydrogen and melting in electric arc furnace	2025–2030 (possibly entry with natural gas)
	alkaline iron electrolysis	foreseeable after 2050
	CO <sub>2</sub> capture and storage or utilisation (CCS/CCU)	2025–2040
<b>Chemical</b>	<b>Key technology</b>	<b>Possible technical availability</b>
	Heat and steam generation from power-to-heat	from 2020
	Green hydrogen from electrolysis	2025–2035
	Chemical recycling	2025–2030
	CO <sub>2</sub> capture at combined heat and power plants	2035–2045

Source: Agora Energiewende/Wuppertal Institut (2019)

This sea change is associated with considerable additional expenditure due to the fundamental character of the technological innovations. Estimates for the steel industry of the additional investment and operating costs that will be incurred by 2030, primarily as a result of the switch to hydrogen technology, amount to a funding requirement of up to 35 billion euros (Agora Industrie/FutureCamp/Wuppertal Institut/Ecologic Institute 2022: 33). For the production facilities of the chemical industry, the “Roadmap Chemistry 2050” estimates an additional investment requirement of 68 billion euros by the year 2050. In relation to the investment sum of six to seven billion euros per year over the past decade, this would be an increase in investment of over 30 percent in the period 2020 to 2050 (whereby it must be taken into account that the investment ratio in relation to turnover was significantly lower in the 2010s than in the preceding decades).

Because of these additional costs, the problem arises that the products manufactured in the renewed plants cannot initially compete with products coming from other manufacturers or from conventional plants at other locations that have already been written off. It stands to reason that

the considerable costs of the so-called market ramp-up cannot be shouldered, at least by parts of the economy, without a wide variety of government support measures (for a discussion of these measures and the conditions under which they should be provided, see chapter 4).

On the other hand, the overall picture also includes potentials for cost reduction as well as new business models that prove possible or even necessary in the process of technological change. In the case of these potentials, a distinction must be made as to whether they serve the interests of socio-ecological transformation or de facto undermine it.

Most importantly, new business models are emerging in the recycling industry, for one thing. As already mentioned, recycling plays a key role in resource efficiency. In principle, there is great potential particularly in the steel industry, as steel can be almost completely recycled. The use of steel scrap can save considerable amounts of emissions. However, up to now, scrap collection in Germany has mainly been used for scrap export - but this shows that this development can be influenced by economic policy.

It will be important for the steel industry as a whole to develop so-called “green lead markets”, i.e. markets supported and promoted by political measures for steel produced in a greenhouse gas-neutral way. There is already strong interest in “green steel” among a number of steel processing companies, which can help them improve their CO<sub>2</sub> balance sheet. In the view of some stakeholders, however, the industry is still too defensive: “Instead of complaining about rising production costs, the aim should be to push through a different price level and to highlight the added value of green steel,” the FAZ (10.3.2022) quotes the CEO of a leading steel trader. The IG Metall demands that the trend towards “green steel” be strengthened by obligatory minimum purchase quotas for steel buyers. The establishment of “green lead markets” now plays an important role in all strategies for the steel industry.

Even greater potentials both in the circular economy and in terms of new products are already becoming visible in the chemical industry. Some large companies even see the fight against climate change in part as an opportunity: take-back and recycling services will be in much greater demand in the future; new chemical products will be needed for recycling third-party materials, as insulating materials for buildings, as materials for photovoltaics and wind power plants, or as plastics for reducing the weight of vehicles. In addition, industrial parks, where basic chemicals plants are often located, offer advantages for the circular economy as

well as common environmental protection facilities. Nevertheless, as in the steel industry, greater regulatory efforts – such as binding recycling rules and minimum quotas for the use of recycled materials - are needed at the EU and nation state level in order to develop generalised recycling markets (Stiftung Arbeit und Umwelt der IGBCE 2023; Agora Industrie/Systemiq 2023). And last but not least, green hydrogen is seen as a promising product for the future, as it becomes the starting material for a multitude of value chains and an important energy storage medium. However, a large hydrogen economy requires high investments: not only in the expansion of renewable energies in Germany, but also in the production infrastructure of domestic chemical companies.

The development of the hydrogen economy is also an important part of the so-called sector coupling. In steel regions in particular, initial - and publicly funded - projects are working on establishing cross-sector alliances in which energy generation, hydrogen production and distribution as well as the storage and use of hydrogen are linked within regional “hydrogen clusters” or “hydrogen hubs”.

On the other hand, it should not be overlooked that a growing share of the production of German chemical companies takes place outside of Germany and the EU. This implies that in principle, large companies in particular can further increase their foreign production in order to escape the local and EU-wide climate protection regulations. However, depending on market perspectives and national-specific incentive systems, there are also initial signs of a contrary trend. BASF, for example, is planning an investment of over ten billion US dollars in Zhanjiang/China, where production plants are to be run entirely on renewable energies.

Another topic is the interactions between decarbonisation and digitalisation which is discussed in both sectors — the so-called “dual transformation”. In the steel industry, they are seen, among other things, in the increase of resources efficiency as well as energy efficiency and are being tested in concrete projects. In the chemical industry, digitally controlled energy management is also expected to improve efficiency in both areas. So far, however, the experts interviewed by Bendel and Haipeter (2022) have only been able to name a few practical examples of synergies between digitalisation and decarbonisation at the company level. In contrast to what the public mainstream suggests, the potentials have yet to be explored and tapped in many cases.

In all of this, it must be taken into account that the public perception of the problems related to the socio-ecological transformation of industry usually focuses only on large companies. In the case of the steel industry, the core sector with 68 percent of the employees is indeed concentrated in a relatively small number of large-scale metallurgical plants, that is, less than one third of all employees work in medium-sized companies. Similarly, basic chemicals are also dominated by a few large companies: 60 percent of the employees in the chemical and pharmaceutical industry are employed in companies with more than 500 employees - which, however, only account for eight percent of all companies in this sector. So when looking at the structures of both industries as a whole, the high number of small and medium-sized enterprises (SMEs) should not be overlooked.

This is very relevant for the socio-ecological transformation of industry, as all experience suggests that many SMEs have significantly fewer human and financial resources to cope with the technological and labour policy upheavals incumbent with this change. As shown in the following this is most evident in the automotive industry.

## 2.3 THE INITIATION OF THE TECHNOLOGICAL AND ECONOMIC UPHEAVAL IN THE AUTOMOTIVE INDUSTRY

The automotive industry is characterised by a “hierarchical, pyramid-shaped sectoral structure” (Blöcker 2022b). At the top are the few car manufacturers (“original equipment manufacturers” / OEM) and a few globally leading supplier groups such as Bosch, Conti, ZF and other large companies. This is followed by other suppliers at several levels - starting with important mechanical engineering and chemical companies and ending with producers of simple mass-produced components at the bottom end, which are purchased worldwide solely on the basis of price. It is obvious that there are a great many small and medium-sized enterprises (SME) within this pyramid. Many of them specialise in individual parts.

This structure is relevant above all because in the automotive industry - even more so than even in the chemical industry - climate and environmental responsibility concerns not only the production processes, but above all the products. As mentioned above, even more CO<sub>2</sub> reduction is required in the transport sector than in the entire industrial sector if the German reduction targets are to be achieved by 2045. The now dominant strategy for meeting this challenge - albeit associated with the braking and evasive ma-

noeuvres mentioned above - is to say goodbye to the combustion engine and switch to electromobility in motorised private transport (for an international overview in English cf. Boewe/Schulten 2023).

Due to the strong interest of car manufacturers in maintaining particularly profitable business models such as the SUV for as long as possible, controversies continue: not only about the timing of the phase-out of combustion technology, but about everything beyond that. In addition to lobbying for synthetic fuels (for a critique of this argument, see Remmers et al. 2019; Hennicke et al. 2021: 274), the so-called “technology openness” includes the question of the extent to which (green) hydrogen should be used in vehicle propulsion. In view of the scarcity of this resource, however, experts consider the use of hydrogen for vehicle propulsion to be sensible and feasible at best in parts of truck transport (cf. Witt 2022b).

Regardless of all the open and contentious issues, however, it is certain that important value chains in the powertrain sector will be eliminated in the future. This does not only affect the engine plants of the car manufacturers, but above all numerous small and medium-sized enterprises in the supply sector. It is also relevant for these SMEs that the car manufacturers are planning to produce more components “in-house” in the future to compensate for the loss of activities in their own factories. All the more worrying in this context is the finding that emerges from an IG Metall (2019) works council survey: in only 28 percent of the companies in the automotive industry, according to the assessment of the works council members, was there at that time a clearly recognisable strategy for coping with the problems associated with digitalisation and the changeover to e-mobility, while in 30 percent there was “none at all” and in 11 percent “rather none”. Works councils from some supplier companies report that management or investors want to “ride the horse until it is dead” (quoted from Candeias 2022: 398).

There is a further uncertainty: parts of the industry still see the technological challenges primarily in connection with the phase-out of the combustion engine. But a change that is at least as far-reaching will be the link with digitally organised mobility platforms. According to Boes and Ziegler (2021: 189), this concept “will become even more important in the future. For the further the development in the field of autonomous driving progresses, the more likely it is that the mobility services of the platforms can no longer be realised by precariously employed bogus self-employed persons, but by robo-taxis, whose organisation and their ability to drive autonomously depend essentially on the availability of efficient cloud environments in interaction

with AI systems in the vehicles.” In other words, the automotive industry is not “just” facing a phase-out of the combustion engine, but a potentially fundamental change in its business model.

This is all the more important as the average weight of new cars in Germany was increased by 12 percent and the average engine power by 23 percent from 2010 to 2020, which enabled an increase in the average sales price of around 50 percent - a strategy that has also been pursued further for e-cars so far (Pardi 2022). It should be borne in mind that the production of electric cars initially causes a larger ecological footprint compared to internal combustion vehicles, primarily because of the raw materials and energy required for battery production. This footprint must be turned into a positive one through the lifetime, mileage, and weight of the vehicle and — and this is increasingly becoming a key strategic issue — through extensive recycling of raw materials and vehicle parts (cf. Blöcker 2022b and Köncke 2022). However, both complex and bold market regulations will be necessary to speed up such initiatives and boost recycling and circular economic activity in particular in the automotive industry (cf. Arbeitsgruppe Alternative Wirtschaftspolitik 2022, Stiftung Arbeit und Umwelt der IGBCE 2023).

One particularly important and growing sector in this context will be battery technology, battery recycling and other areas of the circular economy as well as the development and production of new (recyclable) materials. According to a recent study by RWTH Aachen University, the amount of battery scrap produced annually may increase from the current level of around 10,000 tonnes to around six million tonnes by 2040. This requires — and enables, too — a rapid build-up of recycling capacities and the development of the necessary technologies. From 2035 onwards, the study expects annual revenues of eight billion euros in Europe alone. The investments required for this until then are estimated at almost 10 billion euros. Large companies in the USA and Europe are now entering this business (Handelsblatt, 25 October 2023).

A direct consequence of this simultaneity of the powertrain electrification, the digitalisation, the rise of recycling technologies and the emergence of new business models is that the costs (as well as profits to be expected) in the course of the upcoming technological upheavals are difficult to quantify. Blöcker (2022b) points to the example of a calculation by the German Association of Automobile Manufacturers (VDA), according to which the total investment sum of the automotive industry will already amount to around 150 billion euros by 2025. This sum includes all

innovations that the stakeholders of this industry associate in some way with the decarbonisation of production and products, including fields such as digitalisation and autonomous driving. This innovation complex includes the further automation of production processes, the further digitalisation of the vehicles themselves and, last but not least, the digitally controlled new mobility services just mentioned.

The simultaneity of technological upheavals has far-reaching consequences. The possibility of using new mobility services for future regional shuttle or robo-taxi networks may become a key issue for the decarbonisation of the transport sector. Thus, Boes and Ziegler (2021: 198) argue for an “integrated societal mobility concept” with the aim of “developing alternative and highly sustainable inter-modal transport systems in systemic cooperation with other modes of transport based on assertive municipal actors [in which] the car would be an integral part but no longer the dominant concept”.

However, access to local and regional shuttle services and mobility platforms must not depend on location, technology availability, income, age and other factors. The be-all and end-all of the green transformation of mobility, on the other hand, will be the creation of (digitalised) regional transport networks as a component of public transport. Thus, it is not just a matter of inner-city transport, on which the discussion on the transformation of the transport sector has concentrated so far (cf. on this Bell et al. 2020: 16 ff.). Henniscke et al. (2021: 236 ff.) therefore consider it necessary to expand regional pooling platforms to such an extent that the shares of the “environmental alliance”, including above all local, regional and long-distance public transport, in the total transport volume can be doubled by 2050. Only then would it be possible to reduce the number of cars to the necessary extent. If this is combined with an extension of the life cycle and a reduction in the size and weight of the vehicles, the climate targets in the transport sector can be made achievable with the help of the electrification of passenger car drive systems. Burmeister (2022: 337) therefore rightly states: “The change in powertrain technology is not yet a turnaround in mobility.” And Boewe/Schulten (2023: 33) conclude: “The elephant in the room: A different transport system is needed.”

Such a *green transformation of the transport sector* that goes beyond the decarbonisation of the power train would have an even greater impact on the entire value chain. On the one hand, demand for traditionally supplied products from the steel and chemical industries in particular, but also from mechanical engineering, would decline. On the oth-

er hand, more supply from these sectors would be needed in other mobility-relevant industries. In addition, there are new fields of value creation triggered by the elimination of the combustion engine powertrain - both among car manufacturers and suppliers, especially in mechanical engineering as well as in the chemical industry.<sup>9</sup>

The net balance of all these upheavals in the automotive industry - both in terms of business development and employment forecasts (see chapter 3.1) - must therefore initially be regarded as an open question. Only one thing is already certain today: the more consistently a green transformation of the automotive industry is tackled, the more diverse are not only the technological, but above all the labour and socio-political challenges. And as far as the latter are concerned, it can already be said that they will differ considerably according to regions, fields of activity and over time.

Finally, an important influencing factor is the further development of the globalisation of the automotive industry. The foreign production sites of German motor companies (OEM) now produce 11 million vehicles - compared to 4.7 million domestically. The ramp-up of new factories close to the market is becoming particularly relevant for the rapidly growing market for electric cars in China, which is being driven by the government there through quota requirements and other regulations. At the same time, even before the introduction of the e-car turnaround, manufacturers had already launched major restructuring programmes with high cost-savings targets (reduction of variants, productivity targets, staff reductions). From the employer's point of view, it therefore makes sense to justify personnel cuts — whether at the original equipment manufacturers (OEM) or at suppliers — with the ecological restructuring of the industry, even if this may be more than questionable in individual cases. The range of economic, social and political fields of conflict that this creates is enormous.

Despite all these uncertainties, some fundamental — and widely undisputed — preconditions can be identified that must be created for the technological transformation strategies outlined here to succeed in the steel, chemical and automotive industries.

## 2.4 INTERIM SUMMARY: BASIC TECHNOLOGICAL AND ECONOMIC PREREQUISITES FOR ACHIEVING THE CLIMATE TARGETS

There is one thing all major players agree on: the sufficient availability of green electricity is the be-all and end-all of all plans to decarbonise industry and the transport sector, even if estimates of the longer-term demand for electricity from renewable sources still differ widely. “Electricity from renewable sources is needed beyond the classic electricity application fields for process heat in industry, for the use of heat pumps in buildings, for mobility with electric cars and in local and long-distance public transport, as well as for ‘green’ hydrogen” (Witt 2022a: 20).

It is now a commonplace that the switch to e-mobility can only lead to CO<sub>2</sub> reductions if it is based on green electricity (further prerequisites were addressed in the preceding chapter). Less common is the fact that the massive acceleration of green electricity expansion is also the fundamental prerequisite for any strategy aiming at reducing CO<sub>2</sub> emissions in the chemical and steel industries by the use of hydrogen. As mentioned above, the “Roadmap Chemistry 2050” underlines how electricity-intensive the use of hydrogen is.

According to the calculations of the relevant institutes, a tripling of the expansion rate for green electricity is already necessary by 2030 in order to be able to achieve the climate goals in 2045. Since the federal elections of 2021, after years of obstructing the expansion of green power, this goal has now been adopted by the Ministry of Economics and Climate Protection. This requires a rapid expansion of the necessary infrastructures (such as power lines or hydrogen networks and regional “hydrogen clusters”).<sup>10</sup> The consensus is that all this requires, above all, significantly simplified and shorter approval procedures. The present coalition government has also declared this to be one of its urgent tasks and, in order to speed up the process, has announced a much stronger participation of the municipalities in the profits of green electricity production in order to better overcome resistance to wind power at the regional and local level.<sup>11</sup> The announcements will have to be measured by their realisation — which will foreseeably and necessarily be accompanied by tough conflicts.

9 One example here is the increasing demand for inputs from sectors of the digitalisation value chain, such as chip production, which is now to be significantly expanded in the EU, including Germany (not least to reduce the dependence on imports from China).

10 In November 2023 the Ministry of Economy and Climate Protection has presented a draft plan for the rapid creation of a nation-wide hydrogen network.

11 According to the coalition agreement of 2021, whose practical significance has become more and more controversial, the gov-



What is needed in addition is the creation of a nationwide fast-charging infrastructure for the switch to e-mobility - and not only in Germany. The key players in the automotive industry consider the creation of one million charging points by 2030 to be necessary — and 100 percent on the basis of green electricity. The present government coalition has claimed to support this goal and rightly stated: “The expansion of the charging infrastructure must precede demand” (SPD/Die Grünen/FDP 2021: 40).

If we also take into account the prerequisites of a so-called “turnaround in mobility”, we are of course talking about much larger dimensions - in particular the expansion of the rail network, whose effect of relieving car and truck traffic can only occur in the medium to long term. Here, too, the expansion of the infrastructure must precede the need so that the demand to be redirected in line with the environmental policy requirements can be satisfied at all (or formulated in market economy terms: so that an expanded, improved and cost-attractive offer attracts the demand needed).

Of course, this simple truth does not apply to charging stations or railway lines alone, but to the infrastructure of an ecological transformation of industry as a whole. Both public and private investments must be made in advance. In the case of public investment, the problem is how to reconcile this with the present Federal Government’s reaffirmed adherence to the so-called “debt brake” and its refusal to implement a redistribution-based tax reform — and this with a massive increase in defence spending. This problem has been exacerbated dramatically by the above-men-

tioned ruling of the Federal Constitutional Court in November 2023. A parallel problem pops up at EU level where the German government — together with other “frugal” allies — continues to oppose any more fundamental reform of the Stability and Growth Pact.

Private investments, on the other hand, face the above-mentioned problem of the costs of the so-called market ramp-up. In many areas, they will only pay off in the medium term at best. Even if, as recommended by the relevant institutes, the cycle of maintenance and replacement investments that are due in the next few years anyway is used for the technological upheaval, considerable additional costs will arise in some cases. To some extent, therefore, the necessary investments cannot be realised without public support (preferably on a credit basis) — which further intensifies the demands on public budgets. The spectrum of possible measures includes public investments, direct and indirect subsidies, market regulations (including, in particular, CO<sub>2</sub> pricing and the capping of electricity costs), and Carbon Border Adjustment Mechanisms (CBAM) currently in preparation at national and EU levels, which are intended to prevent the undermining of high ecological standards in Germany and the EU by cheaper competition from countries with lower standards (cf. Fritz 2022 and ephthinktank 2023; for a discussion of these instruments in English cf. Valenduc 2022).

Additionally, in the field of labour policy, not everything that is necessary for the socio-ecological transformation of industry will be available for free, even if the main obstacles are political rather than financial.

### 3. Future-oriented labour policy as the social cornerstone of green transition

When discussing the social aspects of a socio-ecological transformation, two topics are in the focus of public (and partly also trade union) discussion: firstly, the effects of the rising CO<sub>2</sub> price on consumer prices and the costs of individual mobility (this problem was not the subject of the studies presented here). Secondly, the security of *existing* jobs. Although the latter is perfectly justified, it is nevertheless a shortsighted perspective, as “labour policy strategies must be developed for a longer period of time” (Bosch 2022: 4).

This is why Gerhard Bosch based his study on the comprehensive concept of *labour policy*, rather than just labour *market* policy. The problems to be solved here are as diverse as the technological and economic challenges summarised so far. Because this is about people, and first and foremost about those who will be directly affected by the change or already are. “They have to go along with the change and be prepared to continue learning and to take on new tasks with motivation, commitment and hopefully also enthusiasm. In the worst scenario, fears of the future predominate,

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ernment wants to ensure “that municipalities can benefit appropriately financially from wind turbines and larger open-space solar plants on their territory” (SPD/Die Grünen/FDP 2021: 45).

leading to inner resignations and blocking of change, for example by turning to backward-looking climate change deniers" (ibid.: 4). The latter is to be taken very seriously, because "working people who have fewer educational and income resources to fall back on and feel less recognised experience transformation processes as more threatening to their democratic integration than other working groups" (Hövermann et al. 2021: 15).

In the short to medium term the core issue is social security in transition to new employment, both within and between companies or even occupations and sectors. In a medium to longer term perspective, it must also be taken into account that the workers who will then be employed in a new economic territory that is perhaps only partially developed today must already be made fit for this new territory in the education and training system in the years ahead. The socio-ecological transformation of industry thus requires an immediate as well as a generations-long programme.

Let us start with the estimates of the employment effects that the socio-ecological transformation of industry can bring about.

### 3.1 STRUCTURAL CHANGE AND EMPLOYMENT

#### PROSPECTS

Given the early stage in which the industrial transformation is taking place, the available estimates come to different results. As always in the development of scenarios, the assumptions on which they are based are decisive. What is important here is above all which time period is considered, how narrow or how broad the spectrum of possible changes included is and which general estimates of growth and structural change underlie the respective scenarios.

These differences are particularly evident in the automotive industry (for overviews in English of the overall estimates at EU level see Lafeuvre/Guga 2019 and, on Germa-

ny, Krzywdzinski et al. 2023). The estimates referred to by Blöcker and Bosch basically agree in the forecast that the changeover to e-mobility will lead to considerable job losses in the powertrain sector (the order of magnitude here is around 150,000 jobs). This will primarily affect suppliers in this area, whose business areas will in some cases disappear completely, but in the medium to longer term it will also affect the car manufacturers themselves, as the assembly time for e-cars is shorter than that for combustion engines.<sup>12</sup> These changes are to be expected above all in regions with strong automotive industry clusters, and in some cases on a considerable scale. At the same time, however, new fields of activity are emerging - from battery production and the expansion and operation of charging infrastructure and the electricity grid to digitally supported mobility services and the expansion of other transport industries. In part, as in the case of battery production, this can happen in the same regions or even companies where jobs have been lost. However, in many cases — especially where shifts between sectors are involved — this requires a forward-looking regional policy with an activation of regional actors and the mobilisation of their capacities (see below, chapter 4.3).

The interdependence between different sectors must also be taken into account, especially the dependence of value creation and employment in the steel and chemical industries on the automotive industry. Estimates of the overall effects of the turn towards a climate-friendly transport strategy therefore range from minus 114,000 employees by 2035 to plus 60,000 employees by 2040 (cf. Bosch 2022; Blöcker 2022b; on different scenarios of transport strategies with net employment gains, cf. Candeias 2022). Note that behind these net figures, in which job losses are offset against job gains, it should not be forgotten that the effects may differ substantially across regions and sectors.

Less numerous and divergent are the estimates for the chemical industry. Here, a loss of 40,000 jobs is projected for a period of 30 years, which would mean a decline of about ten percent compared to the current employment level. Considering that 20 percent of the employees in this industry are older than 55 and that the level of qualification

12 This corresponds to the assessments of works council members in the automotive industry, which were surveyed by IG Metall (2019) as part of its "Transformation Atlas": for 54 percent of the companies, a decrease in employment is assumed in the medium term (in the areas of manufacturing and assembly, the figure is as high as 61 percent), and only for eight percent of the companies an increase. However, it is also important to consider the causes: In 43 percent of the companies, a reduction in employment is expected due to relocations abroad, in 28 percent of the companies due to the conversion to e-mobility. This again highlights the problem that was already pointed out earlier: due to the interlocking of different processes taking place at the same time, personnel cuts may be justified with the socio-ecological restructuring of the industry, even if in many cases there are other main causes. The relocation to countries in central and eastern Europe – amongst suppliers even more pronounced than amongst OEMs – has begun long before the reorientation towards electrification (cf. Krzywdzinski 2019).

is above average, the problems are certainly easier to cope with compared to the automotive industry.

In the steel industry, things are somewhat more complicated. It is true that here, too, the level of qualification is high and the employment effects in connection with the transition to low-emission technologies are estimated to be rather low. The problem here is above all the global overcapacities combined with strong productivity increases in this sector, so that the employment trend in the German steel industry has already been in sharp decline for decades (by around 120,000 employees since the beginning of the 1990s). Therefore, further development will depend to a large extent on government support and promotion of the technological changes described in chapter 2.2, including the open questions regarding sufficient green energy and green H<sub>2</sub> supply, under the conditions of global competition (cf. Witt 2022b and Fritz 2022).

The latter aspect reminds us of the importance of the political framework conditions that implicitly or explicitly underlie all estimates. A classic example here is the employment trend in renewable energies. Due to the slump in the expansion of wind power plants due to the failure of earlier federal governments, the number of people employed in this sector fell from 160,000 to 122,000 within just two years - from 2016 to 2018 (BWE 2021).<sup>13</sup> If the current federal government is serious about its plans to expand renewable energies, this trend will turn positive again in the coming years.

However, the effect of policy choices on overall employment development can also be seen in other ways. If more significant efforts in boosting resource efficiency and circular economy are assumed, the forecasts will lead to greater restructuring of the economy than in other scenarios. Initially, there may then be a considerable need for additional investment and employment due to the greater expansion of the public transport sector and the restructuring of cities, among other things, before the volume of work declines again in the longer term (OECD 2020). The longer-term development is then likely to depend most on the question of the extent to which health care, education and other "system-relevant" personal services are expanded, which are to a large extent tasks of the public sector or should become so again. This will not least bring the question of how to close the income gap between industry and social services even more to the fore.

Against the background of the crucial importance of public policy for the socio-ecological transformation of industry, two factors therefore must be borne in mind: firstly, the structural changes will have very different employment effects across sectors and regions. In the short to medium term, this can pose similarly large social problems for regional development as in, for example, the shutting down of coalfields. Secondly, it can be assumed that the time periods in which positive or negative effects can be expected will also be very different. For this reason, it must be emphasised again: the socio-ecological transformation of industry requires both an immediate and a generational programme. This includes a wide range of public policy, collective bargaining and company level instruments which impact on labour and mobility processes on the labour market.

### 3.2 THE WHOLE RANGE OF LABOUR POLICY

In his study, Bosch (2022)<sup>14</sup> highlights five dimensions of labour policy that are of particular importance for the socio-ecological transformation of industry: firstly, preparation for *internal* upheavals in affected sectors and companies; secondly, "investment" measures in labour market policy, which must pave the way for *inter-company* transitions in the event of threatened redundancies; thirdly, support for *voluntary* change from shrinking to growing sectors and companies; fourthly, *intergenerational* modernisation of vocational training; and fifthly, *wage policy* flanking structural change by strengthening collective bargaining coverage. His proposals for reform with respect to labour market regulation in Germany, which are elaborated in detail, will be summarised below. The focus here will be on aspects that may also be relevant for other countries.

#### PREPARATION FOR INTERNAL UPHEAVALS

Many companies, which will be massively affected by the restructuring of industry in a few years' time, have so far adjusted to it only insufficiently or not at all. There is a widespread lack of forward-looking human resources (HR) strategies, which Bosch (2022: 14) calls a "reactive" HR policy. This is particularly pronounced in smaller and medium-sized companies that do not have their own personnel departments.

<sup>13</sup> Just for comparison: the German lignite mining employs less than 20,000 people in total.

<sup>14</sup> A short version of this study has been published in English (Bosch 2023).

This applies above all to further training as an important instrument for both internal and inter-company reorientation. According to IG Metall's (2019) "Transformation Atlas", which was based on a survey of almost 2,000 works council members, only 45 percent of respondents attested that their company had fully or partially systematically identified qualification needs.

In the upcoming phase of change, however, large parts of the workforce will have to be further trained in a relatively short time. Larger companies are in a position, as Bosch describes it using the example of a VW plant, "to bear the considerable expenses for the conversion of the plants and the training and further education of the employees themselves. Since they later profit from the returns of the transformation, the financing of these investments is also part of their responsibilities from a regulatory point of view and should not be done through public funds." (Bosch 2022: 15)

Small and medium-sized enterprises, on the other hand, are often less able to pursue an independent further training policy and are therefore dependent on external offers and — mostly still to be created — networks with other companies. Even if this does not change the responsibility of companies for further training, SMEs can receive financial support from the Federal Employment Agency. To be able to cope even better with restructuring and further training in periods of upheaval, IG Metall proposes the establishment of a "transformation short-time allowance".

Another important tool may be working time reduction in various forms. Many collective agreements now offer the possibility of temporary company or sector-specific reductions in standard working hours (albeit only occasionally with partial wage compensation). Depending on the further course of restructuring, temporary reductions may also provide an impetus for a new phase of general reductions in working time. The interest in securing employment in conjunction with the need for variable working hours over the course of workers' lives can, at least in the medium to long term, provide impetus for the gradual establishment of "short full-time" as a new social standard (Lehndorff 2019).

Temporary or permanent reductions in working time are a proven instrument for securing employment during periods of upheaval, but they cannot change the fact that a proactive human resources strategy must be developed well in advance of such upheavals. An impetus to deal with these problems is to be given by what IG Metall calls "future-oriented collective agreements". Such bargaining

frameworks have been in place for the metal industry at regional levels since 2021. Depending on the concrete design, works councils may gain new opportunities to overcome an important hurdle that favours reactive personnel policies: insufficient information and codetermination rights (cf. Bosch 2023).

According to the works councils surveyed by IG Metall (2019), the workforce in 41 percent of companies was "not at all" sufficiently informed about the changes they would face in the coming years, and in a further 31 percent "rather not". The works councils themselves considered themselves to be informed about change projects at an early stage in only 12 percent of the companies and to be involved in the development and implementation of such projects in even fewer companies (eight percent). From IG Metall's point of view, they need to be involved in the planning at an early stage. In her keynote speech at the IG Metall Congress in October 2023, the union's new Chairwoman Christiane Benner (2023) called this "our most important demand for the future. (...) We demand co-determination over the strategic orientation of companies and establishments! We need extended rights that serve to safeguard employment. In personnel planning, staffing levels and training. (...) You are experts."

At least initial starting points for this are offered by some of the future-oriented agreements in the metal industry, which, for example, give works councils the opportunity to work towards identifying the need for further training and improvements of vocational training.

## **"INVESTMENT-ORIENTED" LABOUR MARKET POLICY**

When it comes to preparing inter-company transitions, an "investment-oriented labour market policy" is called for. To achieve this, it is necessary to break with the "work first" paradigm of the so-called "Hartz reforms" of the early 2000s, according to which the fastest possible placement in any available job is seen as the top priority of labour market policy. Instead, those affected by structural change must be enabled through counselling and qualification to take up another job of equal or higher value. "Work first" must be replaced by "train first". Further training — or continuing vocational education and training (CVET) — must be given priority over rapid placement. First steps in this direction have been taken more recently but there is still a long way to go.

Another bridge to new employment can be provided by so-called “transfer companies” which postpone possible unemployment for up to twelve months without reducing the entitlement to unemployment benefit. This time slot can be used for further training and placement, provided that high-quality employment services are available.

## SUPPORT FOR INDIVIDUAL REORIENTATION

An even stronger push in this direction is provided by supportive instruments that encourage employees to take their own voluntary initiative. Interesting experience is being gathered here in Austria and Sweden. In Austria, scholarships are provided for skilled workers which promote further training in occupations with labour shortages. In addition, a part-time “CVET leave” offers financially supported opportunities for further training in connection with a temporary reduction in working hours while maintaining the employment relationship. The Swedish example goes even further as it provides a general “CVET scholarship for adults”. These examples are providing stimuli for the present debate and policy initiatives in Germany.

Another important component is career and VET guidance along with employment. Up to now, the Federal Employment Agency’s CVET guidance has been largely focused on the unemployed and those threatened by unemployment and has been closely linked to the placement business. Now, in some labour market regions, open counselling is being tested for all persons of working age who are interested in change - especially the low-skilled - without a direct link to placement. These pilot projects, called “lifelong career guidance”, can be expanded through cooperation with companies, trade unions and works councils for a more targeted regional management of labour supply.

## MODERNISATION OF VOCATIONAL TRAINING

In the course of a socio-ecological transformation, what used to be a change of occupation may in many cases become a change of activity in a wider occupational field. And this will happen not just once, but perhaps several times in the course of a working life. The German system of vocational education and training (VET) offers comparatively good prerequisites for this. It has long been based on the concept of technology-open basic occupations that open up access to a broad spectrum of activities. On this basis, the further modernisation of training content must

and can be made a permanent task in companies and vocational schools.

However, the greatest challenge in the transformation process to be met in Germany is not the training *content*, but the declining *rates* of young people entering and successfully finishing VET. There is a wide range of reasons for this: the increasingly urgent deficiencies in childcare and the school system (as demonstrated dramatically by the latest PISA survey<sup>15</sup>), the declining willingness of many companies to provide training for cost reasons, the pushing of skilled workers into the low-wage sector, and last but not least the increasing orientation of young people and their parents towards academic education.

Against this background of a growing polarisation in educational levels, there is an immediate need for pay-as-you-go financing of in-company VET, which would relieve the burden on the companies providing the training and place a burden on the free riders. There are already successful examples of this in the construction industry. However, this alone “will do little to change the inadequate education level of many school leavers and the declining attractiveness of training in sectors with high proportions of low wages. It must therefore be embedded in a policy of school reforms, active support for young people in the transition from school to vocational training and a wage policy that upgrades skilled work by increasing collective bargaining coverage” (Bosch 2022: 33).

## INCREASING COLLECTIVE BARGAINING COVERAGE

A major obstacle to the socio-ecological transformation of industry in Germany is the “dualisation” or even polarisation of the labour market. At the beginning of the 1990s, pay levels of 85 percent of all employees were regulated by collective agreements. Today this figure is only little more than 50 percent with a decreasing trend and a strong West-East and industry-services divide (for a short analysis in English of the underlying “internal devaluation” policies see Lehndorff 2016). This fragmentation is a major obstacle to the necessary structural change, not least regarding the urgently needed expansion and creation of much more attractive employment conditions in social services. But it also directly raises the hurdles for ecological transformation. For example, two-thirds of the works councils in the wind-energy industry surveyed by IG Metall (2017) stated that their company had problems filling positions: in com-

15 See <https://www.oecd.org/pisa/>

panies with a collective agreement it was 57 percent, in companies without a collective agreement 90 percent.

At the same time, the share of companies without works councils and with precarious employment has grown: “If, in the course of the transformation, one loses one’s well-paid job in a company that is covered by a collective agreement, the risk of ending up in labour market segments with low wages and precarious working conditions is very high, even if one has good training or has completed further training” (Bosch 2022: 5). What is more, 70 percent of those employed in the low-wage sector in 2019 had a completed vocational education.

The high protection gap is particularly noticeable in the case of involuntary changes of company. By moving to companies not covered by collective agreements, workers risk not only a loss of income, even when performing the same job, but also a devaluation of their own qualifications by moving to jobs that are not appropriate for their occupational level. The “forced” change of company linked with a loss of occupational level is likely to become the rule rather than the exception in sectors with particularly drastic upheavals such as the automotive supply industry in some regions.

As far as Germany is concerned, increasing collective bargaining coverage is therefore one of the key tasks of labour policy supporting the socio-ecological transformation of industry. This will foreseeably be one of the major points of conflict in this area in the immediate future. Against this background, a more substantial increase in the minimum wage than the ones planned so far will be very important. But equally important - and ultimately the strongest levers for reversing the trend towards deregulation - are facilitations of the extension of collective agreements (Schulten 2018) as well as laws on compliance with collective agreements for public procurement (Jaehrling/Stiehm 2022; Refslund et al. 2020).

According to the coalition agreement of the present Federal Government, the latter is to be tackled with the obligation to bind “the Federal Government’s public procurement to compliance with a representative collective agreement of the respective sector” (SPD/Die Grünen/FDP 2021: 56). Some federal states are already leading the way, and given

a total public procurement volume of around 500 billion euros per year, the impact would be even greater if this regulation were made compulsory for all contracts at federal, state and municipal level, as well as for social insurance institutions (Schulten 2021).

Policy initiatives for the extension of collective agreements are much more hesitant. It remains unclear whether and how the blockade approach of employers’ umbrella associations against the extensions is to be overcome. In this context, it will be interesting to see how the German government will deal in practice with the EU minimum wage directive of 2022 which provides that member states “with a collective bargaining coverage below a threshold of 80 % should ... establish an action plan to promote collective bargaining to progressively increase the collective bargaining coverage rate.”<sup>16</sup> None of this would, of course, change the importance of trade union organising and development projects aimed at increasing organisational strength and strengthening collective bargaining coverage (Dribbusch et al. 2018). A politically driven increase in collective bargaining coverage could even provide a tailwind for these campaigns - similar to what became prevalent in the run-up to the latest increase of the statutory minimum wage to twelve euros (Bispinck 2022).

To summarise, it can be stated that as far as labour policy is concerned, the socio-ecological transformation of industry must be regarded as feasible. The next labour policy steps required for this can be realistically described. However, in some policy fields, such as education policy, they are very complex and cost intensive. In other fields, such as increasing collective bargaining coverage, they require a considerable willingness to engage in conflict, not only on the part of the trade unions but also on the part of the government.

This leads us more generally to the role of governments and states. Even though public policy has a key role to play: it cannot relieve companies of their responsibility - their active participation in the labour policy part of the transformation will be crucial in many areas. Trade unions and works councils can and must take a forward-looking role at the sectoral and company level, for which they also require more regulatory footholds. All this will encourage more workers to also take their own initiatives in preparing for new activities and job requirements. Of fundamental and strategic importance in Germany will be to push back the

16 As far as the procedure is concerned, however, the directive remains vague: “In order to respect the autonomy of the social partners, which includes their right to collective bargaining and excludes any obligation to conclude collective agreements, the threshold of 80 % of collective bargaining coverage should only be construed as an indicator triggering the obligation to establish an action plan” (<https://eur-lex.europa.eu>).

polarisation of the labour market, which is the main source of many workers' fears when changing jobs, and carries considerable political consequence.

## 4. All eyes are on the state - rightly so, but is that enough?

The overview presented so far highlights that the state has a key role to play in the socio-ecological transformation of industry. This is now largely undisputed in principle, but after decades of dominance by neoliberal ideology it is worth mentioning further. Regarding the most important measures to be taken, there is now agreement on many points between relevant research institutes, the interest groups of the companies concerned, the trade unions and the environmental associations. However, when it comes to the details, a number of open questions and contentious issues remain. Some of these are of a technical nature - as is to be expected in view of the uncertainties involved in breaking new ground - but in many cases they also express differences and clashes of economic and social interests.

Emphasising the key role of the state, however, does not solve the problem of how the state can develop the capacity to act that is needed to cope with the mammoth tasks, and what "industrial policy" means in practice. For example, where are public subsidies for private enterprises necessary and under what conditions should they be granted? In a different sense, the question of the relationship between the state and private sector actors also arises for social actors such as trade unions. Without the development of their own concepts and initiatives, it will not be possible to build up the social and political pressure that is crucial for the success of the socio-ecological transformation.

Before looking at these conceptual questions, I will first give a short overview of the most important common and contentious positions of the actors: what are they demanding, and what is planned by the present German government?

### 4.1 COMPANIES AND THEIR ASSOCIATIONS

The business associations of the three sectors considered here and their largest member companies formulate some

very uniform basic demands to the Federal Government as well as the EU Commission (cf. among others BDI 2021). The common denominator can be summarised with the following keywords:

1. large amounts of green and cheaper electricity must be made available;
2. the necessary infrastructure for this (and for green hydrogen) has to be provided;
3. financial support is needed for research and product or process innovations;
4. protection against price dumping in foreign trade is necessary;
5. financial relief to ensure international competitiveness must be provided;
6. planning security must be guaranteed for long-term decisions on investment and products.

The *first two points* in particular belong to the elementary technological and economic prerequisites of any ecological transformation of industry, which have already been addressed in earlier chapters. Their realisation will require an enormous economic and political effort. In its "opening balance sheet" in January 2022, the Federal Ministry of Economics and Climate Protection has stated as the basis for its legislative plans that to achieve the climate targets, the rate of expansion of renewable energies must be tripled before the end of this decade - an order of magnitude based on the assessment of environmental institutes (BMWK 2022).

The business associations agree with these expansion plans in principle, but unsurprisingly they insist on significantly lower electricity prices for industry. In the course of 2023, this topic was one of the most controversial issues in German politics and business. Contentious questions — not least within the Federal Government — included: should there be a subsidized price cap focused on companies in energy-intensive industries? Or should there be a general tax relief on electricity costs for all companies? Should households, too, be included in such a tax relief? And even more fundamentally: would such direct or indirect subsidies hinder incentives to save energy?<sup>17</sup> Fun-

<sup>17</sup> The compromise reached within the government at the end of 2023 about a reduction of the electricity tax and the continuing exemption of particularly energy-intensive companies from the costs of the EU-ETS leaves the last two questions unanswered. And it can be assumed that the partial "yes" to both of the first two questions will no longer include a key element of the Ministry of Economic Affairs' original concept which envisaged that particularly energy-intensive companies can benefit from the industri-

damental issues underlying these controversies are the reform of the EU electricity market and the concrete design of the planned Carbon Contracts for Difference (CCfD - see below). The ongoing complaints from manufacturing companies about above-average energy costs in Germany, particularly in comparison to the USA with the additional benefits of the Inflation Reduction Act, are a clear signal that the risk of relocations and the threat of a “de-industrialisation” of Germany is increasingly coming to the fore, regardless of any actual commitment to a green transformation (see above, chapter 1.2).

Another major issue is security of energy supply. This topic has become even more relevant due to the substantial decoupling from Russian oil and gas supplies in connection with the war in Ukraine. Immediate relief is being provided by the establishment of LNG terminals (whose capacities will exceed the imports needed, which may entail unwanted lock-in effects; cf. Witt 2022c). For the time being it is not yet clear whether the shock waves of the Ukraine war will give a boost to the accelerated expansion of renewable energies in Germany or whether the crisis will be used as a pretext for a rollback in energy policy, in particular with respect to continued dependence on natural gas (a revival of nuclear energy as in other countries is likely not a realistic option in Germany as it has been written off by the major energy companies).

As far as the *third point* is concerned, government support for research and innovation is not controversial in principle. It includes a “steel action plan” agreed between the federal government and industry associations in 2020 and updated in 2021, as well as the hydrogen strategy (Witt 2022b), for which the VCI chemical industry association and the IG BCE trade union have submitted joint proposals. Especially in these sectors, there are already numerous funding programmes at German and EU level. Blöcker (2022a) summarises by the example of the steel industry that there is no lack of state support, but what is missing are “targeted support services for a) viable business models for green steel with rising operating costs with clear quotas for steel buyers and b) the rapid implementation of infrastructure projects that are directly geared to the industrial sites of steel companies.” The above-mentioned hydrogen net is to fill an important part of this gap here.

Despite all these commonalities in the approach of the main actors, however, the positions clearly diverge on the

question of whether and how the state should also share in the innovation profits. As a former director of the Foundation Work and Environment of the IG BCE trade union stated: “Unlike in the financial crisis, not only funding costs and losses should be socialised, but also the profits” (Kajsa Borgnäs, quoted from IMK 2020). There are, however, various possibilities for how this should be done: the promotion measures could be designed on a credit basis, linked to later profit sharing or linked to the acquisition of property rights. A public debate on this question is not yet discernible (see also chapter 4.3).

*Points 4 and 5* are technically and politically very complicated. The fundamental problem here is how “competition in the greenhouse” (Fritz 2022; cf. on the following this study) is to be shaped: how can price competitiveness be maintained vis-à-vis suppliers from non-EU regions that do not participate in the EU emissions trading system? Or formulated differently: How can it be avoided that cheaper imports from countries with lower environmental standards displace suppliers from EU countries (“carbon leakage”) - whereby it cannot be ruled out that these importers belong to the same corporations whose locations within the EU are being competed away. This is where the so-called Carbon Border Adjustment Mechanism (CBAM) is supposed to help. It is intended to protect EU suppliers from price dumping competition from other regions of the world. Parts of the industry are in favour of this in principle, but criticise the restriction of this model to imports, while the price competitiveness of exports from the EU at high CO<sub>2</sub> price levels is unclear. What is more, some industry associations criticise the associated loss of free certificates in the EU emissions trading system — which in turn will be crucial for accelerating the reduction in emissions.

What has been discussed for some time as an alternative to CBAM - or as a better solution in the medium to long term that could replace CBAM - is the proposal to establish an international “climate club” extending beyond the EU with a uniform CO<sub>2</sub> minimum price and a common CO<sub>2</sub> border adjustment, so that border adjustment between the participating countries would be superfluous. Johan Rockström, Director at the Potsdam Institute for Climate Impact Research, sees this as an opportunity to form “powerful alliances”: “The biggest emitters would have to join forces and combine their strengths. If you take just four of them, the USA, China, Europe and India, we would regulate more than half of global emissions” (FAZ, 2 March, 2022).<sup>18</sup>

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al electricity price only under the condition that they “make a clear transformation commitment to achieve climate neutrality by 2045.” The plan also included the requirement that “the companies must provide a long-term location guarantee and ... are obliged to act in accordance with collective labour agreements” (BMWK 2023). Such conditions, which are very important from a trade union perspective, are now unlikely to play a role in this context (see also chapter 4.3).

18 As the term “Europe” often refers to the EU, the problem - important in terms of climate policy - of how the Russian Federation could be included in such a climate club in the longer term remains another open question.



However, even then a fundamental problem would not be solved, to which Fritz (2022: 21) draws attention: “The need for transformation in emerging and developing countries is largely neglected”. There is a danger that border adjustment and the climate club “impose adaptation costs on economically weaker trading partners that they may hardly be able to bear”. Climate policy and development policy must therefore be seen in context. At the UN climate conference (COP 28) at the end of 2023, this problem has at least been addressed to some extent.

In view of the focus of large parts of the current debates on the costs incurred by many companies due to climate protection regulations, it is often lost sight of the fact that competitive advantages can also be achieved through innovative products and manufacturing processes. The possibility of triggering innovations through environmental regulations and thus also achieving international competitive advantages is discussed in heterodox economics as the “Porter hypothesis” (cf. Fritz 2022). The fact that this aspect plays a subordinate role in public perception is particularly remarkable for a capitalist market economy like the German one, whose specific strength has long been based on product-based rather than price-based international competitiveness (cf. on this Lehndorff 2016). The examples of new business models referred to earlier draw attention to such potentials. However, until such competitive advantages are achieved, the costs of market ramp-up already mentioned must first be shouldered. In many cases, it will therefore not be possible to do without state subsidies.

An instrument that goes beyond CBAM and is intended to relieve companies of part of the market ramp-up costs in the transition to CO<sub>2</sub>-neutral processes are so-called carbon contracts for difference (CCfD) between the government and companies. If one follows the analysis of Agora Industrie et al. (2022: 47), they are a “strategically important instrument for the long-term climate neutrality and competitiveness of the German economy [...] in order to trigger the necessary investments for this, but must go hand in hand with a comprehensive reform of German and European climate and industrial policy.” However, its precise design, which includes the adaptation of EU state aid law, is still in the works (on all these problems see Fritz 2022 and Witt 2022a).

One may find this strong focus on market-based measures and financial support for companies worthy of criticism. However, it should be clear that the underlying economic problem could not be overcome by the conceivable alternative of a primacy of regulatory law alone. In a capitalist world economy, nation-state or EU-wide bans and prohibi-

tions also trigger cost and price reactions that cannot simply be ignored and must be contained by targeted measures (taking into account the rules and standards of the World Trade Organisation rules, which are, however, also up for debate). True, there is no doubt that large sums of financial subsidies must not be distributed unconditionally. First and most importantly, it must be examined whether the companies concerned need these public funds at all: “Many of the companies could cover the necessary investments from their profits - without government subsidies or tax breaks” (Oxfam 2021: 5). However, if there is a need for subsidies, and this will be the case for many small and medium-sized enterprises in particular, it is - as already mentioned - necessary to tie the support from public funds to conditions imposed by the state that have to be fulfilled by the enterprises concerned as *quid pro quo* (more on this in the following two chapters).

Witt (2022a) draws attention to a further, little-noticed problem of the various cost relief demands of the industry associations. Industries such as the three considered here are already receiving financial relief. Of particular note here is the free allocation of emission certificates, which has brought extra profits to some steel companies, for example, which can now be realised - under the conditions of a rising CO<sub>2</sub> price since the shortage of permissible quantities in EU emissions trading. In short, the problem of market ramp-up costs must be taken very seriously, but the concrete design of the measures to be taken to deal with it requires both expertise and a willingness to engage in conflict on the part of government (and also trade union) actors *vis-à-vis* lobby groups.

This willingness to engage in conflict should be particularly pronounced *vis-à-vis* the automotive industry, whose interest groups have achieved the strongest braking effect on climate protection to date. This becomes obvious when looking at *point 6*, the much-invoked “planning security”. Associations like the car manufacturers’ VDA, which demand this most loudly, have been the most active in hindering and delaying clear directives such as the date from which no more internal combustion vehicles will be registered in the EU, or the massively hyped question of whether the ban on internal combustion vehicles will be defined as “open to technology” (on the problematic of the extremely energy-inefficient “E-Fuels” see chapter 3.1). In short, German business associations often obstruct the development of regulations that are to provide long-term planning security.

It should be clear that the demand for planning security is by no means unfounded - quite the opposite. However, the best planning security comes from a generally binding

regulatory framework, as was achieved over 30 years ago with the CFC ban (e.g. in refrigerators). The focus should therefore be on measures that are crucial for creating the basic preconditions for achieving the targets required by climate policy - both of a regulatory and an infrastructure policy nature. The boost of public investment, as listed for example in the joint proposals by the Macroeconomic Policy Institute (IMK) and the Institute for Economic Research (IW) (Bardt et al. 2019), would help to create the best foundations for planning security.<sup>19</sup> The above-mentioned ban on the public climate protection fund, which was declared by the Federal Constitutional Court at the end of 2023, is a major obstacle to such an economic policy approach.

In addition, there is an aspect that is even more rarely brought up - perhaps surprisingly rarely given the frequently stated mantra that “the state is not a better entrepreneur”. Bendel and Haipeter (2022) report on their discussions with experts in the chemical industry, in which a more classic entrepreneurial view was also presented. They summarise these statements as follows: “It is important to deal with the given uncertainty and to face it adequately. Only companies that can adapt to changing environmental conditions the fastest would survive in the future. This is why some companies are currently over-fulfilling regulations when introducing new production technologies to be one step ahead of possible changes in the law. This applies in particular to investment-intensive plants that must last for several decades and cannot be adapted technically without difficulty. However, the need for long-term and far-reaching investments is in tension with the short-term profit interests of shareholders” (ibid.: 22 f.).

Here - from a business perspective - a problem is addressed that usually plays a role in discussions critical of capitalism: What practical possibilities are there to give sustainability criteria greater weight compared to the short-term interests that often dominate in financial market capitalism? This raises the fundamental problem of forms of ownership, but also more immediate questions - for example, how state subsidies can be linked to conditions such as the extension of co-determination rights. These issues are highly relevant in the context of trade union demands and considerations.

## 4.2 TRADE UNIONS

The leaderships of the two unions in charge with the industries covered here, IG Metall (IGM) and IG Bergbau, Chemie, Energie (IG BCE), are pursuing today a course that clearly goes beyond the traditional approach of securing employment in companies affected by industrial restructuring. This is also expressed in stronger cooperation with environmental associations, which have long been a driving force in these issues and are now also placing greater emphasis on the social aspects of a green transition. As mentioned above, a number of research institutes play a central role here, too, contributing significantly to the gradual reorientation of important actors in the industry with studies (such as Agora Energiewende/Wuppertal Institut 2019) and advisory activities based on them. This can also be seen in some of the examples of joint initiatives by business associations, trade unions and environmental associations described below.

The more recent reorientations in the policies of IGM and IG BCE beyond immediate job security are by no means self-evident. They tie in with two quite different lines of tradition. The clearest change in recent years can be observed in the IG BCE, which represents workers in coal mining and (partly) in energy companies as well as in the chemical industry. Bendel and Haipeter (2022: 25) summarise it as follows: “The defensive stance towards ambitious decarbonisation targets gave way to the advocacy of a transformation focused on industrial policy.” The programmatic basis for this has been provided by the Foundation Work and Environment which is associated with the union IG BCE.<sup>20</sup> A first impetus was given in 2019 by a study on a “just energy transition” which has since been expanded by further conceptual publications. At the latest since the so-called coal compromise and the federal “coal exit law” of 2020, the official policy of the trade union is therefore no longer dominated by the attempt to put the brakes on urgent changes in climate policy for the purpose of securing employment. In the chemical industry in particular, a proactive strategy of socio-ecological restructuring is increasingly being pursued - following the “social partnership” tradition of the IG BCE in close cooperation with the employers’ side.

In IG Metall, the development is somewhat more complex, as it works on an even broader policy field. In the steel

19 It should be noted that IMK is part of the Hans Böckler Foundation of DGB, while IW is run by the industry umbrella association BDI and other business associations. This gives just a flavour of how contradictory and sometimes even divergent the positions of German business associations on the question of financing public investments are.

20 So far, the IG BCE is the only union in Germany which has established a research foundation focused on environmental studies and just transition (cf. <https://www.arbeit-umwelt.de>).

industry, it has been acting just as proactively at sectoral and company levels for several years as IG BCE is now doing in the chemical industry. In the automotive industry the development is more fractured and contradictory. As early as the 1980s, the union began a conceptual strategic debate on the future of this sector. However, this practice was largely forgotten in the course of the economic and political upheavals of the 1990s. Today, depending on the company, section and level of activity, there are sometimes very different or even opposing attitudes within IG Metall to the socio-ecological transformation of the automotive industry - especially when it is seen in connection with a change in mobility (cf. Boewe et al. 2022). Irrespective of all these differences, the declared overall policy of IG Metall — which is supported by large parts of the organisation including many automotive industry works councils — has a primarily proactive orientation and takes the broad field of action required for the socio-ecological transformation into consideration. An example of a particularly advanced position was given by the then chairman of the works council of the biggest VW engine plant in Kassel, which is being massively affected by the upheaval in the powertrain system: “What we need are fewer cars, smaller cars, an expansion of local public transport with demand-oriented call-bus and car-sharing services for rural areas. Of course, you still need cars for such a transport system. We must create the conditions for this in the next ten years. [...] We need regional concepts. For example, we have companies here that build rail vehicles or bus components. [...] Jobs can be created there if we expand public transport and rail networks” (Carsten Bätzold quoted after Boewe/Schulten 2021).

The proactive orientation is also expressed in discussion groups, initiatives, and joint platforms with environmental associations and other social actors at various levels. The spectrum here is now quite broad. At the central level there are formats such as the “Bündnis sozialverträgliche Mobilitätswende” (Alliance for a Socially Compatible Turn-around in Mobility) made up of DGB, IG Metall, ver.di, various environmental and social policy organisations and the Protestant Church. Perhaps even more relevant in practice are local and regional networks including unions, works councils, employers chambers, and other actors geared to develop transition strategies for regions which are heavily dependent on the automotive industry (more on this in the next chapter).

A particularly interesting example of joint action has been the campaign for higher wages and better working conditions in the public transport sector organised by the service sector union ver.di and Fridays for Future under the slogan

“We ride together” (#WirFahrenZusammen; cf. Lucht/Liebig 2023).

At the same time, both the executive boards of the industrial trade unions IG Metall and IG BCE advocate a strategy, especially regarding infrastructure and industrial policy (particularly with regard to the steel and chemical industries), which at its core has broad overlaps with the companies in the sectors concerned. This includes demands for the acceleration of grid expansion for renewable energies, the promotion of new key technologies, state incentives for investments in environmental technologies that only pay off in the medium term, and the creation of stable EU-wide framework conditions for energy-intensive industries such as “carbon leakage” protection and uniform (preferably lower) industrial electricity prices. Growing attention, especially in the chemical industry, is also being paid to the question of how not just a “carbon leakage”, but also a “green leakage”, i.e. a migration of companies to countries with more efficient “green” infrastructures, can be avoided by developing as efficiently as possible regional renewable energy networks (Stiftung Arbeit und Umwelt 2021: 64).

These common positions — although of course not down to every detail — provide a basis for cooperation with both industry associations and environmental organisations. For example, since 2021 there has been a so-called stakeholder platform “Chemistry for Climate”, where experts from companies, trade unions, environmental associations, and politics develop sector-specific concepts on the most pressing problems of the green transition.

Of course, the two trade unions are setting their own agendas in other policy areas of the socio-ecological transformation and in some cases are going well beyond the industrial policy consensus with the employers’ side. An example of this are the demands of IG Metall to the present Federal Government under the title “#Fairwandel” (IG Metall 2021a and 2021b). In addition to widely undisputed demands for the energy transition, the creation of hydrogen infrastructure and massive investments in rail transport and local public transport as core elements of a mobility change, the programme includes demands on labour policy (such as the promotion of a second vocational training – cf. chapter 3.2), the linking of public subsidies for companies with employment and investment commitments, the promotion of resource-saving recycling management, collective agreements as a prerequisite for public procurement, and comprehensive public investment with the help of tax reforms and an “adjustment” of the so-called debt brake.

Evidently, trade union concepts in some core areas of the socio-ecological transformation of industry go far beyond the consensus not only among the business federations but also within the government. First and foremost, fundamental trade union demands for:

- a reform of the “debt brake” (including the relief of over-indebted municipalities), without which it would be unrealistic to shoulder the cost of additional public investment of 500 billion euros by 2030, which is considered necessary (not only) by the trade unions, as well as
- redistributive measures through tax reforms (progressive wealth tax, higher taxation of corporate profits and high incomes, relief for low and middle incomes), which serve both to finance the transformation and to cushion its social costs.

It is foreseeable that these issues will play a central role in the public controversies related to climate policy in the coming years – even more so after the November 2023 ruling of the Federal Constitutional Court. And it is also foreseeable that climate policy will come into sharp competition with massive rearmament programmes after the “turn of the times” declared by Chancellor Scholz on 27 February 2022. Programmatically, the trade unions – also with their rejection at the DGB Congress of a commitment to the NATO two percent target (DGB 2022) – are in principle well positioned to bring their political mandate to bear in these controversies.

In addition, there are topics that are particularly relevant for the practical implementation of a socio-ecological transformation of industry. They include, as already mentioned:

- the question of the conditionality of public subsidies for private companies
- the concrete shaping of regional structural policy, which will take on central importance especially in connection with the expansion of public transport
- the extension of co-determination rights of works councils to questions of personnel planning or even investment strategies.

Lobbying (which has proved to be valuable in some cases) will not be sufficient to make progress on such controversial key issues (Urban/Ehlscheid 2022). These are issues in which trade union capacity for action and conflict must be developed and built up as quickly as possible. This presupposes dealing with yet unresolved conceptual and practical problems and also conducting debates on them within one’s own ranks. For only one thing is indisputable: even if – or precisely because – all eyes are on the state, a broad commitment of societal actors is needed to make the state

more capable of acting and to be able to influence the direction of its actions.

These challenges and the first steps towards dealing with them will be briefly discussed below without claiming to offer definitive answers to open questions.

### 4.3 THE STATE ALONE WILL NOT FIX IT

In each of the last three topics mentioned there is a connection between conceptual preparatory work and the ability of social actors to exert more influence at the political level. This is linked to new tasks – not only, but in particular for the trade unions.

Regarding the *conditionality of public subsidies for private companies*, further conceptual clarification and political specification would be helpful. The fundamental question is whether the financial support for transformation by the state should be granted as a unilateral benefit to private companies or whether this must also be linked to financial and procedural obligations of the recipients. In all of this, it should be taken for granted from the beginning that a contribution by the companies themselves must be demanded, at least insofar as their profitability permits. From a trade union perspective, the minimum consensus here may be the idea summarised by IG Metall’s Chairwoman Christiane Benner (2023) at the union congress in October 2023: “We need clear rules: Tax money only in return for a collective labour agreement, guaranteed employment, and apprenticeships! Only then will there be funding! And not otherwise!”

The more trade unions elaborate such ideas and demands, the more concretely the question arises as to the possibilities of an institutional anchoring of the conditions in question. An important impetus is given here by the concept of transformation funds with which companies, including above all small and medium-sized enterprises, are to be supported in the conversion to future technologies, in the associated market ramp-up costs, and in labour policy reorientations. A report prepared by the Labour and Environment Foundation of the IG BCE together with the Macroeconomic Policy Institute (IMK) of the Hans Böckler Foundation (Stiftung Arbeit und Umwelt/Institut für Makroökonomie und Konjunkturforschung 2021) points the way forward. It proposes the creation of a credit-financed federal transformation fund in the amount of 120 billion euros, which would link public contributions of capital with an obligation to invest into climate-friendly technologies,

production processes and products. Through participation either by credits or by co-ownership, the Federal Government can participate in future returns, build up an investment portfolio and avoid socialising costs and privatising profits: “Direct participation or financing by the Federal Government in key industries also has, in principle, the advantage that a direct influence can be exerted on the implementation of climate and sustainability goals and, for example, active participation by trade unions can be supported” (ibid.: 5). The latter corresponds to trade union demands mentioned earlier which aim at providing public subsidies under the condition of compliance with collective agreements, the extension of co-determination rights or the obligation of companies to use climate-friendly production processes both at home and abroad.

Trade union involvement is in principle relevant at all levels of policy: from individual companies up to economic, industrial and labour policy at federal (partly also EU) level. In between lies sectoral and regional policy, which must be bundled into a transformation-oriented *regional structural policy*. At the centre of the proposals and initiatives of trade unions, environmental associations and other actors is the creation or further development of regional “transformation councils”. However, as Blöcker (2022b) states, especially with regard to the supplier sectors of the automotive industry, “many practical steps are still missing for a goal-oriented structural policy in particularly affected regions”.

Unlike the linking of state support with quid pro quos from companies, there is no resistance from business associations to overcome here, but that does not make things any easier. The task now is to learn from the rich and very mixed experiences in regional structural policy: “What would be necessary is a focus on central issues and challenges of transformation; this requires clear programmatic priorities and guidelines” (Gärtner/Rehfeld 2021: 105). The overarching theme in regions particularly affected by decarbonisation is the question of how social upheavals can be prevented and promising structures can be created in the course of this process. It is therefore a matter of turning particularly affected regions into places and pioneers of innovative change.

Against the backdrop of this ambitious objective, both the insights gained during the decades of structural change in the Ruhr region and the current debates about the future of the remaining lignite regions draw attention to some neuralgic points and further considerations:

- The linchpin is innovative networks of regional actors (Beese et al. 2019). It is important to develop cooperation among actors coming from very different milieus who bring very different interests and perspectives, and also different human resources.
- The overriding challenge of such networks is the development of joint projects that serve an overarching concept and policy guideline for the future of the region. By way of example, Sittel et al. (2020: 171 ff.) suggest developing a “model region of sustainable mobility” in Thuringia in which many individual measures are bundled together: from individual companies to industrial policy and university research. If these guiding principles and the funding institutions tailored to them are lacking, then public expenditures can seep away in broad-based regional transformation funds, rather than being targeted to suit specific purposes. The jointly supported guiding principles will also have to include regional social services as well as education policy as central components of human resources development.
- It will be important to link such models with the existing “sectoral competences” of the respective region (Greib et al. 2019: 49). This is equally relevant for industrially weak and industrially strong regions, as the latter are particularly affected by the switch to e-mobility. Schwarz-Kocher/Stieler (2019: 53 f.) report on local and company “potential workshops” for the development of future concepts, which analyse the locally available capabilities against the background of future requirements and opportunities. The same approach is practiced by IG Metall which has started to organise company-related “transformation workshops” or “future workshops” with works councils and employees, in particular in regions dominated by the automotive industry.<sup>21</sup> Ultimately, this is about what Dörre (2021: 231) calls the “politicisation of expertise”. If such initiatives are networked regionally, it is also possible to establish “links between the automotive industry and other areas of the mobility economy” that have hardly existed so far (Blöcker 2020: 222).
- Public, transparent and participation-based funding structures are important. In view of the multitude of programmes at EU, federal and regional levels, a funding map is lacking. There is a great need for reform here, as a comprehensive status report presented by the DGB shows (Hennicke 2021). Transparency and participation are important for all local actors, including trade unions and works councils, that need resources for professional support of their company and regional policies.
- Public institutions are indispensable for transformation-oriented regional structural policy, and here the municipalities are particularly important. Their importance is based, on the one hand, on their large share –

21 For an example see <https://atlas-swf.de/qualifizieren/transformationenwerkstatt/>.

amounting to 55 percent! - of all public investments. On the other hand, they are - at least potentially - the closest “direct contact”, where one can experience “whether or not the state is capable of acting in the adjustment process” (Hennicke/Noll 2020: 4).

- The municipalities also play a key role in the development of transport systems as an essential component of any ecological regional structural policy. And not only within the respective city boundaries, but also within the region. Thus, as emphasised above, the development of public regional mobility services will have to become a central contribution to reducing individual traffic and the number of cars (Hennicke et al. 2021).
- The important contribution of municipalities to regional structural policy is also based on their potential for “sector coupling” of energy supply and mobility. For example, municipal utilities can start model projects geared to advance a connection of hydrogen production and electrification of public transport. Of course, all this presupposes that these areas are not privatised and that the municipalities have the necessary financial resources.

In the three industries covered by our project, there are some promising approaches that address the challenges outlined here. These include, among others, the establishment of regional transformation networks, which are funded by the Federal Ministry of Economics and Climate Protection as part of the “Future Fund Automotive Industry”. These networks, which have been initiated by IG Metall in most cases, are to address and mobilise regional actors (companies, trade unions, works councils, chambers of industry and commerce, employment agencies, municipalities, and many others) for the development of transformation projects in automotive regions.<sup>22</sup> These networks are also used by IG Metall to organise and advertise the “transformation workshops” focused on individual enterprises mentioned above.

In such contexts, regional and local trade union organisations as well as works councils can actively engage in the transformation process. These are, mind you, initial approaches. It will be decisive how the exchange of experience can be advanced both between the social actors and within the associations involved - and here above all within the trade unions. Conceptual groundwork and networking of actors are prerequisites for the development of the ability to act and assert oneself.

This connection is also crucial in the third of the issues dealt with here, where trade union concepts go beyond the con-

sensus with business associations and the government: the *extension of co-determination rights*. As Bendel and Haipeter (2022: 33) note, co-determination can relate to several aspects of transformation processes, including “the selection of technologies, the introduction of technologies and the handling of their consequences for work organisation, working conditions or further training needs. [...] For codetermination rights on these issues, an extension of company co-determination would be necessary, which could refer to new arbitration procedures, but also to the quorums required for the relocation of production or sites. Here, the Volkswagen regulation could be taken as a model, according to which relocations require the approval of two thirds of the supervisory board members.”

Notwithstanding the further specification of trade union demands in this field, it is quite clear that these interact closely with the initiatives of a regional structural policy like the one outlined above: one is dependent on the other. And there is also no question that the “systematic work overload of works councils” (Brinkmann et al. 2022) must be taken into account and that already the claim for proactive, transformation-oriented works council policy is associated with considerable demands on internal trade union qualification. As Bendel and Haipeter (2022: 27) found in their interviews with works council members in the chemical industry, “the topic [decarbonisation] is much less present and hardly a subject of their co-determination policy. First of all, this is due to the fact that the framework conditions of transformation are currently determined at the industry level and have not yet found much expression in the companies. [...] Knowledge of the technological and business implications of climate change [is] still insufficient in companies. This skills deficit is much more pronounced in the case of decarbonisation as compared to digitalisation.”

However, conceptual and competency deficits with regard to the analysis and mobilisation of company potentials to initiate the transformation do of course not only exist among works councils. Schwarz-Kocher/Stieler (2019) describe this as a major problem in the management of many SMEs in the automotive supply industry in Baden-Württemberg, which can be countered with the “potential workshops” mentioned above. With regard to the chemical industry, the VCI industry association also sees this as a major internal difficulty in many of its member companies and is developing networks of consultation and exchange, especially for SMEs in this sector.

As far as the majority of works councils in particular in SMEs is concerned, it should be taken for granted that a transformation-oriented, proactive policy approach geared to

22 For some examples see the networks in Lower Saxony (<https://retrason.de>), in the Saar region (<https://www.igmetall-bezirk-mitte.de/transformation/transformationswerkstatt-saar>) or in Westphalia (<https://atlas-swf.de>).

influence strategic company decisions has not been part of their traditional bread-and-butter business so far. Ecological product innovations require close cooperation with representatives from technical and product development departments, to which works councils and trade unions still have too little access in many companies. The above-mentioned “potential workshops” for the development of future concepts, which were initiated and investigated by the Stuttgart-based IMU Institute, serve to precisely promote this cooperation and mobilise this expertise (Schwarz-Kocher/Stieler 2019). The same applies to the IG Metall-initiated “transformation workshops” in some regions.

Of course, trade unions and works councils can already play a forward-looking role at company level even without extended co-determination rights, as initial experiences in connection with the “future-oriented collective agreements” in the metal industry show (Bosch 2023). They offer IG Metall an important starting point for entering into strategic discussions with employers. However, as one consultant involved in these processes says, “the negotiations and the future-oriented collective agreements still have to be filled with content, with life” (IMU 2021: 6). This includes “agreeing on future products and location perspectives, investing in employees and their skills [...], involving the employees in the visions of the future and the works councils concretely in the implementation and monitoring of success even after an agreement has been concluded” (ibid.).

All experience suggests that individual pioneering examples are most likely to become widespread practice when

an interaction develops between newly acquired co-determination rights on the one hand and trade union commitment to their use on the other. But the starting point for this is necessarily the promotion of the competences of trade union actors at the workplace and local level, from which the pressure for extended rights grows.

To make progress, IG Metall has started to train many of its officers as “change facilitators” who support works council members in participatory projects. However, the lack of resources for real participation remains a major gap. With their limited resources, the trade unions will not be able to advise works council members as intensively as they can with external consultants in model projects. This is why Bosch thinks that “public funding of transformation agencies that could provide this advice is urgently needed, especially in view of the enormous research and development funds made available to companies and their networks through the major technology programmes” (Bosch 2022: 20).

Both the example of the development of regional transformation networks and that of fostering co-determination by “future-oriented collective agreements” draw attention to the importance of strengthening the competences and capacity to act of social actors. This is the only way to achieve the necessary interaction with public policy at all levels. This should also be kept in mind in the concluding overview of the political course that must be set, above all, at the levels of the Federal Government and the EU: the most important current “building sites” of the socio-ecological transformation of manufacturing industry.

Table 2: Building sites, problems, conflict issues - a rough overview

Policy areas	Building sites	Conflict issues
Infrastructure policy/investment	Green electricity and grid expansion: Tripling the pace of expansion EU wide electricity market design	Areas and acceptance Acceleration of approval procedures with democratic participation How to foster participation of municipalities? Public budgets
	Green hydrogen (H <sub>2</sub> ): Infrastructure (H <sub>2</sub> networks) Market ramp-up of climate-neutral H <sub>2</sub> Networks from production sites to central industry clusters	Which areas of application of H <sub>2</sub> have priority? Ecologically and socially sustainable H <sub>2</sub> imports: 70 percent from 2030? From where, under what conditions, with which accompanying programmes? Public budgets
	Turnaround in mobility: Battery charging infrastructure Investment in public transport Public (!) regional mobility platforms	One of the most controversial issues, including: Reduction of size / weight / number of cars Time span and financing of turnaround Ownership of transport networks Public budgets
Industrial policy	Strategic promotion of research	Public share in future profits
	Reduction of environmentally harmful subsidies (cf. criteria of the Federal Environment Agency)	Huge potential of increasing revenues, but highly controversial
	Subsidies for technological innovations in private companies Public „Transformation Funds“	Potential disincentives for de-carbonisation Who needs public support? Public share in future profits Conditionality of subsidies (cf. IMK proposal on “Transformation Funds”)
	New business models (recycling networks etc.) ... Public procurement ...	... to be considered in conditionality of subsidies ... linked with ecological and social criteria
CO <sub>2</sub> reduction via market price regulation	How to accelerate effectiveness of EU ETS? How to safeguard cost-based competitiveness? (CBAM; CCfD; - see below)	Reduction / abolition of gratis emission rights Social compensation for private households
CO <sub>2</sub> reduction via regulatory law	End date for the registration of internal combustion vehicles without loopholes Binding CO <sub>2</sub> limits in other areas (incl. bonus-malus system) Supply chain criteria	Almost everything highly controversial Bans and regulations also have (indirect) price effects
Energy and resource efficiency (circular economy)	Extension of durability of products Turnaround in mobility incl. reduction of vehicle population Binding recycling rules and minimum quotas for the use of recycled materials EU Ecodesign Directive and Energy Efficiency Directive must be extended and made mandatory Inclusion of ecological footprint in supply chain legislation Huge business potentials in recycling of batteries and other critical raw materials	How to regulate export of recyclable products to non-regulated regions of the world? More effective design of regulations for reduction of resource consumption and more resource efficiency (through regulatory law and/or economic incentives) Raw material requirements of electrification
Global implications / trade policy	Carbon Border Adjustment Mechanism (CBAM) and possible alternatives	Exact design of CBAM (accuracy, prevention of wind-fall profits similar to EU-ETS)
	Additional prevention of carbon leakage through Carbon Contracts for Difference (CCfD)	WTO conformity EU state aid law Potential disincentives for de-carbonisation
	H <sub>2</sub> import from „Global South“	How to connect with green and just economic development in Africa/Latin America – rather than “green colonialism”?



Policy areas	Building sites	Conflict issues
Labour policy	Intra-company and inter-company mobility: <ul style="list-style-type: none"> <li>■ Further training</li> <li>■ "Future-oriented collective agreements"</li> <li>■ "Transformation short-time allowance"</li> <li>■ (Temporary) working time reductions</li> <li>■ Extended co-determination</li> </ul>	Partly in progress; most controversial: co-determination
	"Investment-oriented" labour policy: <ul style="list-style-type: none"> <li>■ Priority of continuing vocational education and training (CVET) over job placement</li> </ul>	First steps in progress
	Individual reorientation: <ul style="list-style-type: none"> <li>■ Part-time "CVET leave" (role model: Austria)</li> <li>■ "CVET scholarship for adults" (role model: Sweden)</li> </ul>	First steps in progress; further extension cost-intensive
	Vocational training as a multigenerational project: <ul style="list-style-type: none"> <li>■ Rate of vocational education and training (VET) graduates must be increased</li> </ul>	VET financing on pay-as-you-go basis Higher apprenticeship rate requires reform of the socially divisive education system (childcare, elementary schools, higher education)
	Strengthening of collective bargaining coverage: <ul style="list-style-type: none"> <li>■ Reform of extension mechanism</li> <li>■ Compliance with collective agreements as binding criteria in public procurement at all levels</li> </ul>	Highly controversial
Societal mobilisation	Participation of municipalities	weak financial basis, often over-indebtedness
	Regional transformation networks	First steps in progress, but long and bumpy road
	Workplace or company-wide co-determination on transformation planning (fostered by "future-oriented collective agreements")	Most controversial is the conditionality of public subsidies: all linkages with obligations concerning job security and the expansion of trade union and works council rights, e.g. inclusion of future-oriented collective agreements or codetermination rights
	Development of trade union competence and mobilisation capacities at company, sectoral and regional levels	In progress (e.g. "IG Metall change moderators"), but limited human and financial resources

## 5. Summary: A mammoth project with many building sites

The socio-ecological transformation of industry is usually seen as a primarily technological challenge. The terms “socio-ecological” or “green and just” already indicate that this approach falls short. It is not only from a trade union perspective that the linking of technological and economic policy innovations with fair work is a key issue. Only if this connection succeeds will the upcoming upheavals have a social basis that makes the transformation politically feasible.

As far as the technological innovations necessary to achieve the climate goals are concerned, relevant research institutes consider them possible in principle. But these institutes always emphasise that the technological challenges can only be met with unprecedented political efforts. These efforts must be tackled or intensified in very different policy fields, such as financial and industrial policy, regulatory law, labour policy, or regional policy. Much of this is controversial, and as is to be expected when breaking new ground: Quite a few central questions are still open. Table 2 gives an incomplete and necessarily simplistic impression of the major building sites of the socio-ecological transformation of industry. It is just to give a flavour of the complexity of this process.

The overview also underlines the complex constellation of actors: companies and their interest groups, trade unions and works councils, environmental associations and state actors at all levels – municipalities, regional governments, the Federal Government, the EU Commission, and supra-national institutions such as the World Trade Organisation. After decades of neoliberalism, governments are again widely recognised as playing a key role as strategic investors and regulatory enablers. What exactly is involved, how

it is shaped, whose interests take precedence - all this, of course, remains highly controversial. The core of these conflicts is again and again how “strong” or “big” government should become, especially in relation to private-sector profit interests.

As important as these controversies are, they must not obscure an underlying question: How can a *strong* government become a government which is *capable of acting* in practice? Clarity, purposefulness, transparency, and reliability of government action are conditions of societal trust in the state. At the same time, clarity, purposefulness, transparency, and reliability presuppose the ability to act. To (re)establish the ability to act, it is not only necessary to thoroughly turn away from the tendency towards privatisation and from the belief that the market manages best. Equally important is the financial capacity to act through a redistribution-based increase in tax revenues. And last but not least: democratic anchoring.

Democracy is of particular importance for the socio-ecological transformation. The key to the success of this fundamental change, which will affect the everyday lives of millions of people, is the development of broad social acceptance and support for the change. The political mandate of trade unions, in close cooperation with environmental associations and other societal forces, must be brought to bear in order to turn market-dominated technological innovations into a transformation that is both ecological and social. The development of concrete concepts necessary for this cannot be delegated to government agencies, even if it requires their comprehensive support. Public authorities will only be able to act if they can rely on the commitment of societal actors.

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CL: Carbon leakage

DGB: Deutscher Gewerkschaftsbund (German Trade Union Association)

EU-ETS: EU Emissions Trading System

HR: Human resources

IG BCE: Industriegewerkschaft Bergbau, Chemie, Energie (Mining, chemical and energy workers union)

IG Metall: Industriegewerkschaft Metall (Metalworkers union)

IMK: Institut für Makroökonomie und Konjunkturforschung der Hans-Böckler-Stiftung (Macroeconomic Policy Institute of the Hans-Böckler-Foundation)

IW: Institut der deutschen Wirtschaft (German Economic Institute)

LNG: Liquefied natural gas

OEM: Original equipment manufacturer

SME: Small and medium-sized enterprises

SUV: Sports utility vehicle

Ver.di: Vereinigte Dienstleistungsgewerkschaft (United Service Sector Union)

VCI: Verband der Chemischen Industrie (Chemical Industry Association)

VDA: Verband der Automobilindustrie (Automotive Industry Association)

VET: Vocational education and training

WTO: World Trade Organisation

## ABBREVIATIONS

BDI: Bundesverband der Deutschen Industrie (Association of German Industries)

BMWK: Bundesministerium für Wirtschaft und Klimaschutz (Federal Ministry of Economics and Climate Protection)

CBAM: Carbon Border Adjustment Mechanism

CCfD: Carbon Contracts for Difference

CCS: Carbon capture and storage

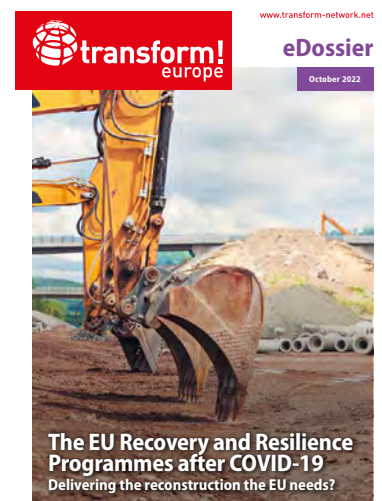
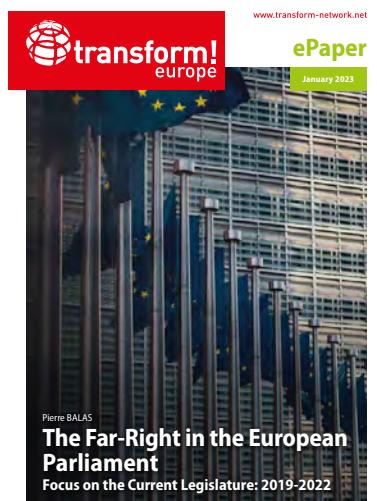
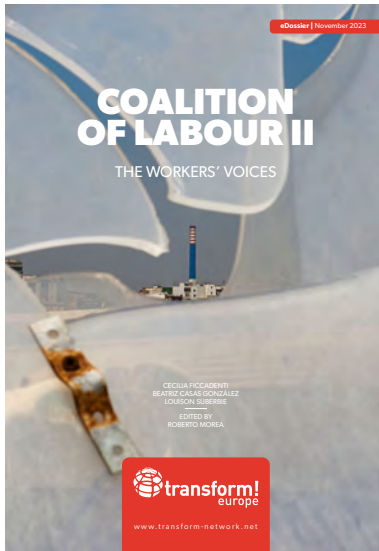
CCU: Carbon capture and utilisation

CFC: Chlorofluorocarbon

CVET: Continuous vocational education and training



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www.latautonomy.com

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### Czechia

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### Finland

Left Forum  
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Democratic Civic Association – DSL  
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Espaces Marx  
www.espaces-marx.fr

Foundation Copernic\*  
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Foundation Gabriel Péri\*  
www.gabrielperi.fr

Institut La Boétie  
institutlaboetie.fr

### Germany

Journal Sozialismus  
www.sozialismus.de

Rosa Luxemburg Foundation – RLF  
www.rosalux.de

Institute for Social, Ecological and Economic Studies – isw  
www.isw-muenchen.de

### Greece

Contemporary Social History Archives – ASKI\*  
www.askiweb.eu

Nicos Poulantzas Institute – NPI  
www.poulantzas.gr

### Hungary

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www.balmix.hu

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www.transform-italia.it

Cultural Association Punto Rosso (Associazione Culturale Punto Rosso)  
www.puntorosso.it

Fondazione Claudio Sabattini\*  
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### Poland

Foundation Forward / Naprzód  
www.fundacja-naprzod.pl

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### Romania

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### Serbia

Centre for Politics of Emancipation – CPE\*  
www.pe.org.rs

### Slovenia

Institute for Labour Studies – IDS\*  
www.delavske-studije.si

### Spain

Alternative Foundation (Catalonia)  
www.fundacioalternativa.cat

Europe of Citizens Foundation – FEC  
www.lafec.org

Foundation for Marxist Studies – FIM  
www.fim.org.es

Instituto 25M\*  
www.instituto25m.info

Iratzar Foundation (Basque Country)\*  
www.iratzar.eus

### Sweden

Centre for Marxist Social Studies  
www.cmsmarx.org

### Turkey

Social Investigations and Cultural Development Foundation – TAKSAV\*  
www.taksav.org

Sol-Blog\*  
https://solparti.org

### UK

The World Transformed – TWT\*  
www.theworldtransformed.org

Transform! UK – A Journal of the Radical Left  
www.prruk.org

\*Observer

## European network for alternative thinking and political dialogue

transform! europe is a network of **40 European organisations from 23 countries**, active in the field of political education and critical scientific analysis, and is the recognised political foundation corresponding to the Party of the European Left (EL).

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