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German Just Transition: A Review of Public Policies to Assist German Coal Communities in Transition

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About the Project

This report is part of a series of papers prepared by Resources for the Future (RFF), Environmental Defense Fund (EDF), and other partners that examine policies and programs to promote fairness for workers and communities in a transition to a low–greenhouse gas emissions economy, often referred to as a just transition. The series looks at existing public policies and programs, grouped thematically as "tools

in the toolbox" for policymakers seeking effective strategies to address challenges associated with transition. We focus on policies and programs that can support workers and communities in regions where coal, oil, or natural gas production or consumption has been a leading employer and driver of prosperity. Other reports in the series present illustrative case studies of energy transition policies abroad.

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Abbreviations

ABMs – Labor Procurement Measures

AFTSC – Act on Financing the Termination of Subsidized Coal Mining

APR – Action Program Ruhr

CC – Commission on Growth, Structural Change and Employment (or Coal Commission)

CCCL – Coal Commission and Coal Exit Laws

CPGTA – Coal Power Generation Termination Act

DPR – Development Program Ruhr

EFRD – European Fund for Regional Development

ESF – European Social Fund

EU – European Union

FICSR – Future Initiative for Coal and Steel Regions

FIRNRW – Future Initiative for the Regions of North Rhine–Westphalia

GRW – Joint National/Länder Task for the Improvement of Regional Economic Structures

IBA – International Architecture Exhibition

IBAEP – IBA Emscher Park

JT – Just Transition

JTF – Just Transition Fund

JTM – Just Transition Mechanism

LDA – Land Development Agency

NRW – North Rhine–Westphalia

NEA – National Employment Agency

SMEs – small and medium enterprises

Executive Summary

This report examines public initiatives implemented in Germany to support workers and communities impacted by the decline in coal production from the 1960s to the present. The main goal is to present key policy alternatives and lessons from the German case to inform Just Transition (JT) processes in other countries and regions.

With the prospect of phasing out coal and sharply cutting use of other fossil fuels in the United States due to greenhouse gas mitigation efforts, it is worth looking at the successes and failures of past transitions. Germany has intentionally steered its coal reduction process since the 1960s to prevent detrimental economic and social consequences. A central characteristic of the German approach to mitigate the impacts of coal decline for workers and regions is the use of **integrative policies** based on a combination of policy goals and mechanisms.

The report examines **historical policies** (implemented between 1968 and 2019) and **present policies**. Their main goals can be characterized as (a) **economic diversification and reorientation**; (b) **workforce support**; (c) **social well-being and quality of life**, and (d) **environmental remediation and protection.** Moreover, these policies have commonly employed three mechanisms: (1) **financial support for public organizations, businesses, and workers**; (2) **service and assistance for public organizations, businesses, and workers**; and (3) **direct investments**.

Large public investments in infrastructure and environmental remediation have been central goals of the policies analyzed over time. Providing financial support and assistance for businesses and workers has also been a key component of most policies. These policies especially targeted businesses until the 1980s. In more recent decades, a tendency toward financial support of local governments and nonprofit organizations can be observed.

The report also characterizes the implemented policies according to their governance structures, namely their design, implementation, and forms of public participation. From the 1960s through the 1980s, **top-down policies** predominated; these were designed, implemented, and administered by subnational governments with limited participation of local stakeholders. Since the end of the 1980s, municipal governments have implemented a more **regionalized approach** with bottom-up policies, including local participation.

Beyond the policies that explicitly support coal workers and regions, key "**baseline policies**" played a large role in JT in Germany. They include the German social security system, the labor system, and the system for regional fiscal equalization.

In this report, we highlight the following lessons from the German experience to inform JT policymaking in other contexts:

1. Historical policies implemented in Germany tended to focus on protecting the coal industry and promoting coal production. Since the 2000s, policies began to

proactively steer the transition away from coal. This **anticipatory and preventive approach had a positive impact on job creation and in the formation of new industries in coal regions** (IWH 2020; Bade and Alm 2010; Untiedt et al. 2010). Following a similar approach, the Commission on Growth, Structural Change and Employment (also called the Coal Commission) and subsequent laws have aimed to reduce the risk of economic, social, and environmental problems caused by the decline in coal production. In comparison to the transition in other old industrial regions in Europe, such as the United Kingdom, the reduction of hard coal production in Germany during the 1960s was handled in a more socially compatible way (Brauers et al. 2020), as none of the former coal workers became unemployed directly but instead either entered early retirement or follow-up employment that helped to protect their socioeconomic status.

2. Large-scale government investments and industrial policies have been central aspects of the approach to support coal regions in Germany. In the beginning of the German coal industry crisis, these policies incentivized investments that aimed to restrengthen or conserve the role of traditional industries, which prevented a transition and instead led to high debts and deficits in public budgets. The increasingly **proactive role of the public sector in regional economic policy has been important to attract new businesses and promote economic growth.** The implemented policies helped to create new economic opportunities and jobs in many of the locations where they have been deployed (IWH 2020; Bade and Alm 2010; Untiedt et al. 2010).
3. Policies to support coal regions have been particularly successful when tailored to the local realities and needs. **Including active participation of local stakeholders in the design and implementation of these policies is important not only from a procedural justice perspective but also to create more locally coherent and effective interventions.** Incorporating local actors also increases social acceptance and the usage of existing regional knowledge, an important factor in accelerating the transition away from coal. The German experience also shows the importance of providing local governments with enough financial resources to implement these measures themselves. This can reduce the need for coordination between the political levels and hence reduce related transaction costs.
4. Most of the policies implemented in Germany to support coal regions combine multiple policy objectives. Since the 1990s, policies have prioritized the quality of life of local communities through economic, cultural, and environmental interventions. **This integrative and holistic approach is important for addressing the transition away from coal as a multidimensional problem and creating synergies between different interventions**. This approach contributes to improving the attractiveness of addressed regions and can promote social cohesion.
5. The German social security system, the labor system, and the system of regional fiscal equalization are critical components in Germany's efforts to assist workers and communities affected by the decline in coal production. **Given the relatively strong support that the German social security net provides to coal workers, most of the policies included in this review should be seen as a complement** to these baseline policies. Emphasizing that the JT policies exist in addition to these

baseline policies is particularly important in order to avoid overestimating their potential replicability in other contexts with weaker social and labor protection systems.

6. These policies may provide valuable examples to inform the design of **new JT initiatives in other contexts**, although the challenges that lie ahead **may require even more holistic and forward-looking initiatives** to accelerate the transition away from fossil fuels while investing in the future prosperity of workers and communities.

Contents

1. Introduction

In 2020, the German government signed a law to end coal production and usage in Germany no later than 2038, bringing to an end the historical role of coal as the country's most important primary energy source (Bundesregierung 2020c). Hard coal (anthracite) production ended in 2018 after the implementation of a 2007 law to gradually eliminate subsidies for that industry. However, imported hard coal has remained a relevant resource in the power mix, and Germany is still one of the world's largest lignite producers (IEA 2020).

The decline in hard coal production started six decades ago, when the influx of cheap foreign coal and oil forced German coal production to peak in 1957 at 150,000 million metric tons and 600,000 workers (Statistik der Kohlenwirtschaft e.V. 2018a; 2019b), spurring a crisis in the domestic coal sector. Lignite production peaked in 1985 (430 million metric tons; 160,000 workers), before the reunification of East and West Germany, and then decreased by more than half during the 1990s due to the lower competitiveness of the East German lignite industry in relation to the West German one (Statistik der Kohlenwirtschaft e.V. 2018a; 2019b).

During the past 60 years, mining regions in Germany have experienced enormous transformations, including deindustrialization and economic decline, high unemployment and emigration rates, and environmental degradation due to the legacy of highly polluting industrial processes. German policymakers have sought to address these issues through the implementation of a variety of policy measures since the 1960s (Oei et al. 2019; Herpich et al. 2018).

The term "Just Transition" (JT), which gained prominence in the late 2000s, acknowledges the need to mitigate climate change without disproportionally burdening segments of society dependent on the production of fossil fuels. Particularly important for JT is ensuring fairness for workers and communities subject to negative impacts of the transition away from fossil fuels (BGA 2020). According to the International Labour Organization, JT "needs to be well managed and contribute to the goals of decent work for all, social inclusion and the eradication of poverty" (ILO 2015, 4). JT also involves "anticipating impacts on employment, adequate and sustainable social protection for job losses and displacement, skills development and social dialogue, including the effective exercise of the right to organize and bargain collectively" (ILO 2015, 6).

This review provides insight for policymakers into the policies implemented in Germany to ease the economic, social, and ecological impacts associated with the decline in coal production. We believe these policies provide valuable examples for the design of new initiatives to promote JT in other contexts.

1.1. Scope of this review

We examine policies implemented in Germany from the 1960s to the present to support workers and regions impacted by the decline in coal production. Given the

Box 1. Germany's Level of Governance

Germany is a federal republic composed of 16 federal states (*Länder*). National laws are made by the German parliament, a bicameral legislature that consists of the Bundestag and the Bundesrat. While the Bundestag is directly elected by universal suffrage, members of the Bundesrat are appointed by and represent the *Länder*. Representation of the *Länder* in the Bundesrat is based on the number of inhabitants. The *Länder* have the right to legislate in all areas that are not vested solely in the Bund by the German constitution (called "Basic Law"). Each of the *Länder* has its own constitution, parliament, government, administrative structures, and courts. In addition to the national level and the *Länder*, Germany has 11,054 municipalities. Although municipalities institutionally belong to the *Länder*, in practical terms they constitute a different level of governance at which most public tasks are carried out.

Administrative responsibilities by level

National government	The national government exercises legislative authority in areas such as foreign policy, defense, currency, citizenship, freedom of movement, air transport, post and telecommunications services, industrial property rights, and national statistics. The exercise of executive power is limited to a few areas, such as foreign affairs, administration of national waterways and shipping, social insurance institutions extending beyond the jurisdiction of specific *Länder*, and national corporations and institutions.
Subnational states (*Länder*)	The exercise of state power and the discharge of state functions is a matter for the *Länder*. They are thus responsible for implementing national legislation. National and *Länder* powers sometimes overlap in areas such as justice, social welfare, civil law, criminal law, labor law, and economic law. However, in general, the *Länder* have exclusive legislative powers regarding culture, education, universities, local authority matters, and the police.
Municipalities	Municipalities are granted the right to organize municipal administration; organize and shape municipal territory by drawing urban development plans; pass municipal bylaws; manage their income and expenditures; and raise local taxes. Optional powers include providing incentives for local economic activity and for housing; establishing social welfare infrastructure; building and maintaining public transport infrastructure, cultural affairs, and sport facilities; managing energy supply utilities; and establishing twinning arrangements with local authorities in other countries.

Source: BMWi (2021c). Germany's governance structure is also influenced by EU legislation. The *Länder* have a say in European affairs through the Bundesrat. The national government is required to inform the Bundesrat promptly of all plans at the EU level that are relevant for the *Länder*. The European Union plays an important role in Germany's JT policies for at least two reasons: (1) the European Union's competition law regulates the type of state aid that Germany can provide to companies in coal regions and therefore shapes the type of JT policies implemented domestically (Lorenz 2013), and (2) the European Union provides financial support to Germany's coal regions through several investment programs to promote subnational regional development among its member states. Recently, these types of policies have explicitly included incentives for JT initiatives (see Section 3.2).

earlier decline in hard coal, most of these policies focus on regions that produced hard coal rather than lignite. We also include policies that targeted steel-dependent regions, given that the coal and steel industries were economically codependent, vertically integrated, and concentrated in the same regions.

Moreover, while we mostly cover place-based policies that explicitly seek to support

coal-dependent regions, we also include interventions with a broad geographical and economic scope that have been important for coal regions.

This review covers policies designed, financed, and implemented by the national government, the 16 federal states (*Länder*), municipalities, and the EU (see Box 1). To provide a more detailed account and to avoid redundancies, most of the review focuses on policies implemented in the Ruhr area (see Section 5), highlighting its long experimentation with different approaches to support local communities and workers affected by the decline in coal production.

1.2. Types and mechanisms of JT policies

The policies and initiatives covered in this review can be categorized according to their main policy goals:

A. **Economic reorientation and diversification.** This category includes policies that promote economic diversification and reorientation away from coal. These are based, for example, on the development and improvement of infrastructure, the creation of educational and research institutions, the attraction of new businesses, the promotion of local firms, and the formation of technological clusters.
B. **Workforce support.** This category includes policies to protect workers affected by the decline in coal production, including employees in the coal sector and related industries. Policies in this category complement the national framework to support workers through three main strategies: integrating labor market policy in regional development policies, co-financing job and employment measures, and investing in training and qualification infrastructure.
C. **Social well-being and quality of life.** This category includes policies that support better living conditions in coal regions by addressing social and cultural needs. Examples include initiatives to support cultural, artistic, and recreational activities. They also include programs to develop and modernize civil facilities and public infrastructure, promote urban development, protect cultural and natural heritage, and improve regional public perceptions and touristic attractiveness.
D. **Environmental remediation and protection.** This category includes policies to ensure the environmental remediation of former mining and industrial sites, such as programs for the decommissioning, rehabilitation, and recultivation of coal mines and industrial sites and landscape restoration. It also includes initiatives to remediate other environmental impacts caused by the coal industry and mitigate possible impacts after the shutdown of operations, such as water management, air pollution control, and nature conservation programs.

These policy categories are interrelated, with many initiatives generating spillover effects into nonprioritized areas. Moreover, many policies address more than one of these objectives simultaneously (see Section 3.2.1). In addition to these policy types, we discuss baseline social safety net policies in Germany, which provide a foundation

for all of the above policies, as well as a regional structural policy approach, which has been fundamental to how Germany has addressed the coal transition.

The policy types we discuss tend to be implemented using three main policy mechanisms, defined by the type of benefits provided:

- **Financial support.** These mechanisms include the following: **(a) Financial support for public and nonprofit organizations** supports entities such as local governments, educational and research institutions, and community and environmental organizations. This mechanism has taken the form of grants, subsidized loans, and state-backed loan guarantees. It has been used in investments on infrastructure, training, education and research programs, and environmental remediation. Funding for this type of support has come from a variety of sources, including the national government, *Länder*, municipalities, the European Union, and public and private banks. **(b) Financial support for businesses** may include grants, tax benefits, subsidized loans, state-backed loan guarantees, debt repayment schemes, and interest subsidies. Funding for these forms of support has come from the national government, *Länder*, the European Union, and private banks. While some policies have financially supported specific economic sectors, others have supported all sectors. The type of financial support has varied according to the size of the business, their location, and their stage (existing versus new firms). **(c) Financial support for workers** can consist of early retirement benefits, health care, and unemployment allowances for workers. This category also includes the creation of publicly financed temporary jobs (predominantly low-skilled and low-wage jobs).
- **Service and assistance.** These mechanisms include the following: **(a) Service and assistance for public and nonprofit organizations** provides operational support to community and other local nonprofit organizations, assistance with grants and funds applications, and administrative support for the implementation of local programs and projects. **(b) Services and assistance for businesses** includes support such as business consulting and advice, and assistance with grants, loans, and funds applications. **(c) Services and assistance for workers** may consist of programs to help workers relocate to different companies or industries, training and retraining programs, and career services.
- **Direct investments.** These mechanisms directly support the development and improvement of infrastructure, such as railways, highways, hospitals, and educational and research facilities.

Table 1 summarizes the policies reviewed (see Section 5 for detailed descriptions of the policies).

Table 1. Summary of JT Policies Examined in this Report

Policy name	Administrator	Target	Policy types[a]				Funding sources
Historical policies			**A**	**B**	**C**	**D**	
Development Program Ruhr (DPR), 1968–1971	Subnational (NRW)	Workers in the Ruhr region	X	X	X	X	National government NRW European Community
Action Program Ruhr (APR), 1980–1984	Subnational (NRW)	Workers and communities in the Ruhr region	X	X	X	X	National government NRW European Community
Future Initiative for Coal and Steel Regions (FICSR), 1987–1991	Subnational (NRW and municipal governments)	Workers and communities in the Ruhr region	X	X	X	X	National government NRW European Community
IBA Emscher Park (IBAEP), 1989-1999	IBA Association	Communities in the Ruhr region	X		X	X	National government NRW European Community/ European Union Private sector/banks
Act on Financing the Termination of Subsidized Coal Mining (AFTSC), 2007–2018	National government and subnational governments (NRW, Saarland)	Hard coal workers and regions in Germany		X		X	National government *Länder* European Union
Present policies							
Regional development policy framework	National government and *Länder*	Regional development of structurally weak regions (not restricted to mining regions)	X	X	X		National government *Länder* European Union
EU support for Germany	European Union, national government, and *Länder*	Regional development of structurally weak regions (not restricted to mining regions)	X		X	X	European Union
Commission on Growth, Structural Change and Employment (also called the Coal Commission) and Coal Exit Laws (CCCL)	National government and multistakeholder organization	Lignite regions and workers; coal power plant workers	X	X	X	X	National government European Union

[a] Policy types: A. Economic reorientation and diversification. B. Workforce support. C. Social well-being and quality of life. D. Environmental remediation and protection.

1.3. Governance structures

We also identify different governance characteristics of the analyzed policies, namely their design, implementation, and forms of public participation (for examples, see Section 3.7):

- **Design**. Early regional development programs in coal regions were designed top-down, including all the measures and projects to be implemented. Especially since the 1990s, due to higher engagement of municipal governments, these programs became more flexible. Local governments need to follow a general framework defined top-down by the national and/or regional governments, but they have more control of the specific criteria and projects that receive funding.
- **Implementation**. Due to Germany's federal structure (see Box 1), different political levels (EU, national, *Länder*, and municipal) are responsible for the implementation of the policies. Since regional development is the responsibility of the *Länder*, most of the discussed programs are also mainly the responsibility of the *Länder*. Since the 1990s, responsibilities have shifted toward municipal governments, a move that has been characterized by scholars and policymakers as the "regionalization" of these policies.
- **Forms of public participation**. The examined policies increasingly included the participation of local stakeholders, especially since the end of the 1980s. These forms of participation included (1) multistakeholder commissions that provide insights in the design of interventions and oversee their implementation, (2) multistakeholder conferences to create local dialogues about the needs and potentialities of the regions, and (3) grant committees in charge of allocating funding, defining eligibility, and selecting projects.

2. Coal Production and Use for Power Generation in Germany

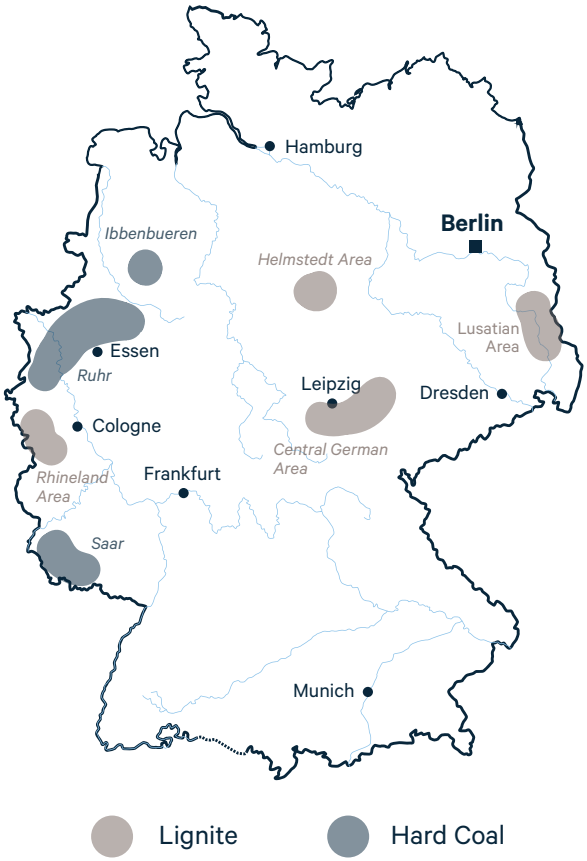
2.1. Hard coal production

At the beginning of the twentieth century, Germany was the third-largest producer of hard coal worldwide, after the United States and Britain. Following World War II, hard coal formed the cornerstone of West Germany's economic, social, and political reconstruction. However, after the liberation of the energy sector, cheap imported oil gained significance, and domestic demand for hard coal began to decline at the end of the 1950s. Moreover, imports of cheaper hard coal replaced domestic production, and the demand from the steel industry, one of the main consumers of German hard coal, rapidly declined (Oei et al. 2019).

Hard coal deposits were geographically concentrated in West Germany (see Figure 1). The two largest mining regions were the Ruhr area, which produced up to 123 million metric tons per year, and Saarland, which produced up to 16 million metric tons per year (Oei et al. 2019). After World War II, the Ruhr area developed into the economic backbone of West Germany due to the production of hard coal and steel. Several large cities are located there, including Dortmund and Essen. Moreover, it is part of North Rhine–Westphalia (NRW), the most densely populated of the *Länder*. Saarland, on the other hand, which was reunified with Germany in 1957 after having been part of France (1920–1935) and then independent (1947–1957), is the second-least populated of the *Länder* (Oei et al. 2019).

Over 600,000 people were employed in the German hard coal sector during the peak in production in 1957. Within 10 years, this number dropped to 280,000 people (Statistik der Kohlenwirtschaft e.V. 2018a; 2019b). In the Ruhr area, unemployment rates increased from 1.6% in 1973 to 5% in 1979 and 10.3% in 1982. Unemployment peaked in 1987 at 15.1% before falling to 10% in the early 1990s and peaking again in 2005 at 16.4%. In the past 10 years, the average unemployment rate in the Ruhr area has been around 11% (Herpich et al. 2018). The last remaining hard coal mine in Germany ceased operation in 2018 after subsidies for hard coal were phased out when the AFTSC was enacted in 2007, as they were no longer in accordance with the EU competition laws (Herpich et al. 2018).

Figure 1. Map of (Former) Coal Mining Regions



Source: Euracoal (2021).

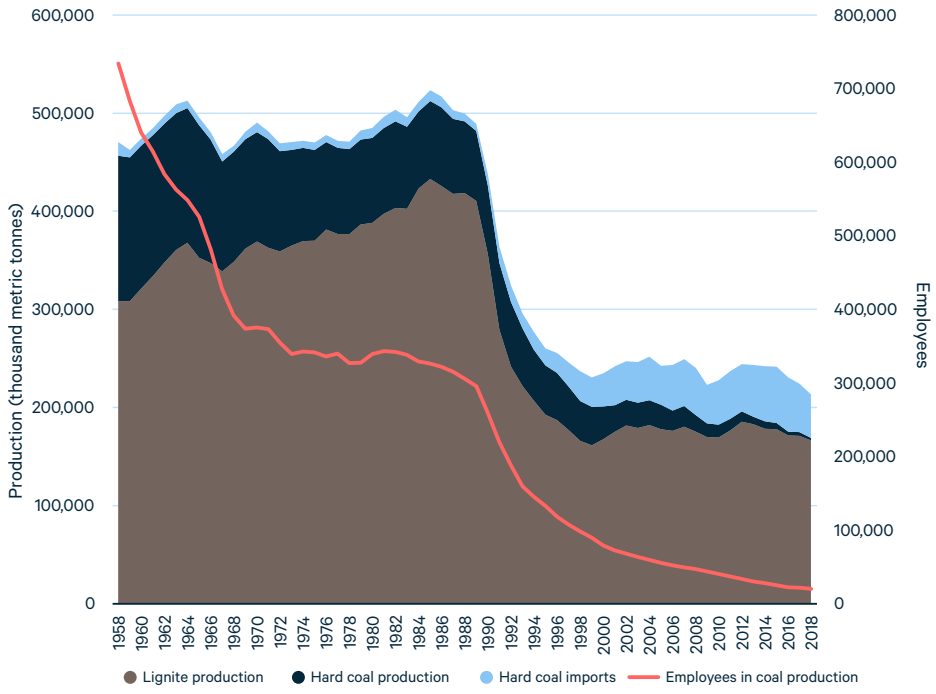
2.2. Lignite production

Unlike hard coal, lignite deposits are distributed in Western and Eastern Germany. Therefore, lignite was available in both parts of Germany during its separation (1949–1990). Currently, most lignite is produced in the open pits of the Rhineland (former West Germany, close to the Ruhr area), Lusatia (former East Germany), and Central Germany (former East Germany) (see Figure 1). Unlike the coal mining regions in Western Germany, the Eastern coal mining regions are mostly rural areas with low population.

Until reunification, production of lignite continuously increased, particularly in East Germany. Lignite production peaked in 1985, with 430 million metric tons and almost 160,000 employees, 90% of whom were located in East Germany (Herpich et al. 2018). Production in East Germany dropped during the 1970s due to the rise in nuclear power and imported oil. With the oil crisis at the end of the 1970s and the failure to achieve an ambitious nuclear plan, lignite production increased again during the 1980s. After reunification, the lignite sector declined in East Germany because its mines were less

productive and more expensive than those in West Germany.[1] Between 1989 and 1994, more than 100,000 employees in East Germany's lignite sector lost their jobs, and production decreased by about 200 million metric tons. Unlike the more gradual hard coal decline, lignite production decreased sharply within just a few years (Statistik der Kohlenwirtschaft e.V. 2018a; 2019a). Since the mid-1990s, levels of lignite production have remained almost constant (see Figure 2).

Figure 2. Lignite and Hard Coal Production, Hard Coal Imports, and Employees in Coal Production, 1958-2018



Source: Statistik der Kohlenwirtschaft e.V. (Statistik der Kohlenwirtschaft e.V. 2018b; 2018c; 2019a; 2019b), Verein der Kohleimporteure (2017, 2019), DIW Berlin et al. (2019), and the authors' own calculations.

2.3. Coal power generation

Because lignite contains a higher proportion of water than hard coal, which makes transportation over large distances economically infeasible, lignite-fired electricity stations are located adjacent to the mines. By contrast, as Figure 3 shows, hard-coal-fired stations are located throughout Germany, with most of them situated in Western Germany, with direct access to large rivers or harbors to unload imported hard coal.

1 In the German Democratic Republic (former East Germany), the lignite sector´s objective was not only output but also job creation. At reunification, the employment objective of the lignite sector was dropped.

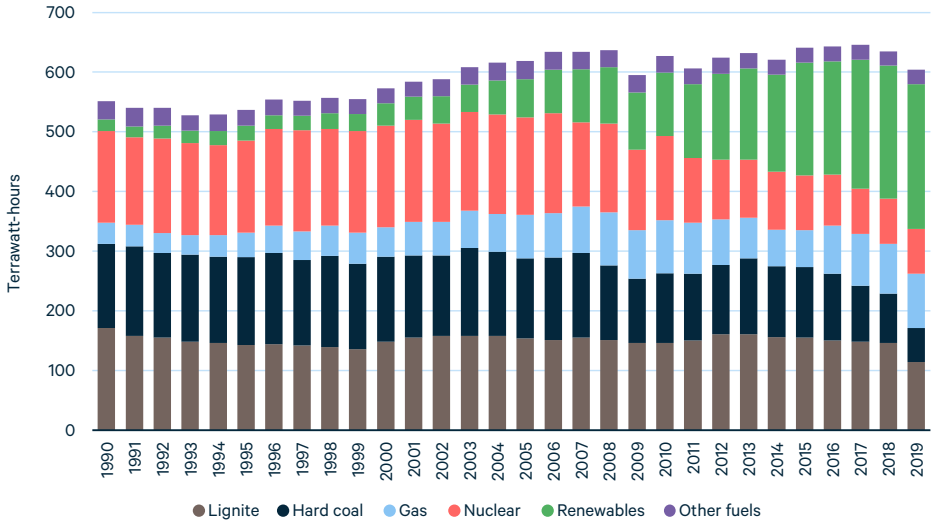
Figure 3. Map of (Former) Coal Mining Regions

Source: DIW Berlin et al. (2019).

Coal consumption for electricity generation increased in Germany until the 1990s and then has declined gradually since the 2000s (see Figure 4). At the end of October 2020, roughly 21 gigawatts of net nominal capacity from lignite and 23 gigawatts from hard-coal-fired power plants were in operation (BNetzA 2020). With the large-scale development of increasingly price-competitive renewable energies, these plants have largely lost economic viability in Germany. In this context, several operators are shutting down power plants before the end of their operating lifetime (DIW Berlin et al. 2019).

In June 2018, the national government appointed a multistakeholder commission, the Commission on Growth, Structural Change and Employment, also known as the Coal Commission (CC), which recommended several policy measures for the complete phaseout of coal power production, considering Germany's greenhouse gas emissions reduction targets and the need to reduce and mitigate the impacts for workers and regions. Partly based on these recommendations, the Coal Power Generation Termination Act (CPGTA) was passed in 2020, according to which all coal-fired stations and lignite mines will be phased out by 2038 at the latest (see Section 5.9.3).

Figure 4. Gross Electricity Generation in Germany, 1990–2019



Source: AG Energiebilanzen e.V. (2020).

3. Policies and Programs to Support Coal Workers and Regions in Germany

In this section we discuss the policies and programs designed to support coal workers and regions undergoing transition in Germany. We begin by describing the system of what we call "baseline policies"—those policies that form the core social safety net in Germany. From there we unpack the regional structural policy approach that has been fundamental to German JT policy. Finally, we discuss each of the four policy types mentioned in the introduction: economic reorientation and diversification, workforce support, social well-being and quality of life, and environmental remediation and protection.

3.1. Baseline policies

To better understand how Germany has dealt with the impacts associated with the decline in coal production, it is fundamental to consider the role of three baseline policies: the social security system, the labor system, and the regional equalization system. We call these "baseline policies" because they have provided major basic support for coal workers and communities, independent of policies explicitly designed for this purpose.

We provide a brief overview of these baseline policies, which does not address the multitude of changes made to these policies during the period covered in this report and especially since the reforms of the 2000s, which considerably weakened the reach of Germany's welfare system (Gongcheng and Scholz 2019). Rather, we emphasize some of the main characteristics of these baseline policies at present.

3.1.1. The German social security system

Germany is internationally renowned for having a relatively strong social security system, which places it among the 10 OECD countries with the highest levels of social spending (25.9% of the GDP in 2019) (OECD 2019b). This system is based on the principles of mandatory coverage and solidarity. Mandatory coverage means that, despite not being universal, the system covers a large portion of the German population—particularly both employed and unemployed people, students, and self-employed people. Solidarity means that contributions are based on individual incomes, but benefits are distributed according to social needs (Gongcheng and Scholz 2019; PWC 2014). The most important areas covered by this system are unemployment, retirement, health care, accidents, and long-term care (see Table 2).

Table 2. Overview of the German Social Security System

Area	Examples
Unemployment	Unemployment benefits, job placement, vocational training
Retirement	Retirement pension
Health care	Prevention, early detection, treatment, sick leave, maternity leave allowance
Accidents	Work accidents prevention and insurance, rehabilitation, vocational rehabilitation, disability, and injury pensions
Long-term care	Support in case of care, dependency on care

Source: BPB (2009).

The following sections describe two areas of the German social security system especially relevant for coal workers and regions: unemployment protection and retirement.

3.1.1.1. Unemployment protection

Currently, two types of unemployment benefits coexist in the German social security system: unemployment insurance (Arbeitslosengeld I) and income support (Arbeitslosengeld II). They are administered by the National Employment Agency (NEA; Bundesagentur für Arbeit).

Unemployment insurance provides benefits for job seekers who were previously employed and thereby made regular contributions to the social security system. This system is funded by contributions from both employees and employers (1.2% of the gross salary each, capped at €7,100 per month in former West Germany and €6,700 in former East Germany). The main condition to receive this benefit is to have had an employment relationship for at least 12 months during the last 30 months before unemployment. The amount of benefit equals 60% of the reference wage (the average earning subject to social insurance in the last year before unemployment) or 67% for people with children. Benefit payments are subject to taxes and social security and health insurance contributions. The duration of the benefit depends on the length of the person's employment and age. People under age 50 are entitled to the unemployment benefit for a maximum of 12 months, and people age 50 and older are eligible for a maximum of 24 months (EC 2020a). Unemployment insurance has been especially important for coal workers, most of whom were employed in qualified jobs covered by mandatory social insurance (RWI 2018).

Income support is a tax-funded benefit administered and paid by local employment offices. This benefit is for job seekers, employees with insufficient incomes, or people who are not entitled to unemployment insurance. It consists of a flat-rate allowance (approx. €430 monthly), contingent upon a comprehensive means test, and provides unemployment benefits for people of working age. This benefit covers health insurance costs and provides allowances for family members and housing expenses (EC 2020a).

Despite being less relevant for unemployed coal workers, who normally have been covered by mandatory social insurance, it is important for residents of coal regions affected by economic decline associated with the phase-out of coal. Moreover, the duration of income support is not restricted, and hence this benefit might become relevant for former coal workers after their unemployment insurance expires.

No data are available to estimate the role of unemployment insurance and income support for coal workers and regions. However, in 2019, 7% of the population of NRW (around 635,000 people) were unemployed (IT Nordrhein-Westfalen 2021), of whom 30% received unemployment insurance and 70% received income support (calculations based on Bundesagentur für Arbeit (2021)).

In addition to cash benefits, the German social security system also provides assistance with integration into the labor market, such as vocational guidance sessions, training, and job placement support through employment offices (job centers). In the reforms of 2003, requalification measures were also introduced, especially to help older job seekers (OECD 2018).

3.1.1.2. Pension system

Coal workers and their families have also benefited from the German pension system, which is considered quite generous by international standards (Hinrichs 2017). This system is based on three pillars: statutory pension, occupational pension, and private pension.

The statutory pension is a public retirement insurance mandatory for all employees. Only civil servants, self-employed individuals, and individuals in certain professions are exempt from it (some of these groups are covered by an independent public plan). The statutory pension is based on a pay-as-you-go model, in which premiums for current pensions are paid for by the working population. The contribution rate corresponds to 18.6% of gross wages below the ceiling of €6,900 per month in former West Germany and €6,450 in former East Germany, with the contribution being paid half by the employee and half by the employer. The pension payment is calculated according to the years of contribution, age, and average income. Monthly average gross pensions currently are approximately €1,500 for men and €1,100 for women (see Box 2). No minimum or maximum amount exists. Special benefits are provided for disabled pensioners and dependents. The statutory pension scheme is administered by the German National Pension Insurance (Deutsche Rentenversicherung Bund) (Bundesregierung 2020b).

The statutory pension is supplemented by occupational and private pensions, which are noncompulsory. These pensions are capital based; contributions are accumulated and capitalized in individual accounts. Following recent reductions in public support for the statutory pension, the national government incentivizes workers to save for retirement in these plans through direct subsidies and tax benefits. Occupational pensions are private pensions provided by companies based on occupational definitions. Occupational pensions are common in Germany, covering about 60% of

the working population and 22% of all payments received by people older than 65. In general, company pension plans are based on collective agreements between workers and companies (BMAS 2020). For miners, the statutory and occupational pensions are combined into the miners' pension insurance (Knappschaftsrente), which involves higher contributions (24.7%, of which 15.4% is paid by the employer and 9.3% by the worker) and better retirement payments for the years worked in mining (Deutsche Rentenversicherung 2020a).

In Germany's pension system, retirement normally begins at age 65; this age will gradually increase to 67 by 2029. In 2018, the retirement age was 64 years (Deutsche Rentenversicherung 2020b). One benefit of the pension insurance system that coal workers have commonly used is early retirement; this is possible at the age of 63, which will be raised gradually to 65. However, pension entitlements are deducted if workers retire before completing 45 years of insured working time (normally 0.3% for each month of premature retirement) (OECD 2015). Roughly two-thirds of workers directly employed in the lignite industry were already 46 years old in 2018 and will therefore be retired by 2038, the latest year where coal might still be used in Germany. Hence, additional compensation is not needed, as the jobs will be reduced as the workers age out. Therefore, the regular retirement policy will cover much of the loss of employment associated with the phaseout of lignite production (DIW Berlin et al. 2019).

Box 2. Support for Women

Coal mining was a male-dominated field. In general, female employment in the coal and steel regions in NRW was substantially lower than the average in NRW (Hombach 1989). The Coal and Steel Regions Commission suggested implementing training and retraining courses tailored to women's needs, orientation and prequalification measures, improvement of opportunities for women to enter industrial-technical professions, and company plans to promote women. Two programs targeted women specifically (Hombach 1989). The ABMs, a labor procurement program, had a supplementary program specifically targeting the employment rate of women. In the FICSR, women received further employment support (e.g., via counseling and qualification). The FIRNRW was meant to target equality between men and women, but few specific measures to achieve this were implemented. In general, equal-opportunity policy aspects were scarce and carefully worded (Knapp 1996).

An interesting comparison is the rapid decline of the coal and textile industries in East Germany after reunification. While the lignite industry or at least the miners received support and public attention, the textile industry, which employed mostly women and foreigners, disappeared quickly without major protest or programs to soften the decline (Thomas 2002).

Moreover, according to the hard coal exit plan of 2007, workers above age 50 (underground miners) or 57 (surface miners) can enter early retirement, which is mainly financed by the national government since the 1960s (see Section 5.1.1). Mining *Länder* have co-financed these early retirement allowances since the 1970s (Storchmann 2005, 1487).

3.1.2. Labor system

3.1.2.1. Labor law

The major sources of labor law in Germany are the national legislation, collective agreements, works agreements, and case law. These laws are entirely governed at the national scale. However, the *Länder* can influence the adoption and amendment of these laws in the Bundesrat.

Codetermination

German labor law is also strongly influenced by EU legislation and case law (ILO 2001). One of the pillars of the German labor law is codetermination (Mitbestimmung), which allows workers to participate in the management of private companies. Codetermination takes place on the company level through work councils (Betriebsrat) and supervisory boards (Aufsichtsrat). Different statutes apply to companies of different sizes and in different sectors of the economy. The most extensive form of codetermination exists in the coal, iron, and steel industries thanks to a specific law enacted in 1952 (the Montan-Mitbestimmungsgesetz), which requires parity representation between workers and shareholders at the supervisory board for companies with more than 1,000 workers. This accounts for all remaining mining companies in Germany. Moreover, employers and employees agree on an additional neutral member for the supervisory board to avoid ties. In coal and steel companies, executives therefore must gain workers' approval before making decisions involving issues such as changes in wages and working hours, layoffs, safety standards, and employee monitoring.

Codetermination has important implications for JT, as it encourages cooperation between executives and workers and integrates coal workers into the companies' decisionmaking (Abraham 2017). The power that codetermination gives to coal workers, for example, was partially responsible for the fact that during the phase-out of hard coal, none of the employees of hard coal producer companies became unemployed. Instead, they either entered early retirement or moved to a different occupation (IG Metall 2021).

Collective bargaining and agreements

Another important element of Germany's labor law for JT is its models for collective bargaining and agreements. There are two main types of collective agreements in Germany: association-level or sectoral agreements (Verbands- or Branchen-Tarifverträge) and company agreements (Firmen-Tarifverträge) for individual companies or establishments. Collective agreements in Germany are negotiated at the branch or industry level by trade unions. Works councils, as nonunion bodies, must regulate and monitor their implementation at company and workplace levels.

In 2018, 46% of employees in Germany were covered by industry-level collective agreements and another 8% by agreements signed at the company level. However,

collective agreements vary across different economic sectors. The energy, water, waste, and mining sector (no data are available for the coal industry specifically) is among the three sectors with the highest shares of collective agreements: 63% of the employees receive wages subject to industry-level agreements and another 18% have company-level agreements (Fulton 2020).

Replacing old mining jobs with comparable jobs has been difficult in Germany given that collectively bargained contracts gave miners many benefits, high payments, and early retirement options. Moreover, collective bargaining and agreements play a central role in distributing responsibilities in the coal phaseout. For example, hard coal power plant operators that want to participate in auctions to set compensation payments for plant closures (part of the coal phaseout law; see Section 5.9.3) need to be part of collective agreements (Bundesregierung 2020c). These agreements avoid operation-related redundancies and cuts in the occupational pension and include additional payments on top of the allowance money provided by the companies as well as rules for the training and reoccupation of younger workers (RWE AG 2020; Ver.di 2020b).

3.1.2.2. Trade unions

The most important workers' organizations in the coal sector today are the trade union for the mining, chemical, and energy industries (Industriegewerkschaft Bergbau, Chemie, Energie; IGBCE) and the United Services Union (Vereinte Dienstleistungsgewerkschaft; Ver.di). Both organizations are members of the German Confederation of Trade Unions (Deutscher Gewerkschaftsbund; DGB), the most important central confederation in the country. The IGBCE, which has a historical stronghold in the Ruhr area, is the third-largest trade union in Germany, with more than 661,000 members. Workers in the electricity sector are mostly members of Ver.di, which is the second-largest trade union in the country with 2,180,000 members (Fulton 2020).

Coal workers have had an important management role within the industry and important involvement in industrial planning and policymaking (Abraham 2017). Unions in the coal sector have played a central role in the history of the German coal industry. For example, since the coal crisis at the end of the 1950s, their influence contributed to delaying the coal decline. The unions also contributed to shifting the end of hard coal production during the negotiations around the AFTSC. Against economic assessments of institutes and universities, the year was shifted from 2012 to 2018 to ensure that no miners were laid off (Frigelj 2009, 228ff). More recently, unions have been key stakeholders in CC negotiations and in the definition of the Coal Exit Laws (see Section 5.9). Both IGBCE and Ver.di had a central role in these negotiations, especially in defining conditions and compensation schemes for workers.

3.1.2.3. Workforce support

In Germany, workforce support is the responsibility of the national government. The general structure of national support has remained relatively untouched, with four main types of interventions existing over the years: financial assistance, job procurement,

training programs, and job-seeking assistance.

Financial assistance

Different forms of allowances (payments) provided by the national workforce support framework have helped coal workers affected by the decline in production. These include wage subsidies, waiting allowances for unemployed persons, transitional aid for older or performance-reduced workers, travel expenses for reemployed and transferred employees, and rent subsidies for dismissed and relocated workers. Older workers also receive adjustment allowances from the NEA, which grant them a portion of their salary (topped up by the employer) until their retirement (for a description, see Section 5.1.2).

Job procurement

The national workforce support framework has also included initiatives that directly create jobs (temporary, low skill, and low paid), some of which have benefited coal regions. This was the case with the Labor Procurement Measures (ABMs; Arbeitsbeschaffungsmaßnahmen), which provided funding to public and nonprofit organizations for the creation of jobs. The ABMs were introduced with the labor promotion law in 1969 and became especially relevant after the oil crises in the 1970s. The aim was to support regions struggling with high unemployment by creating publicly funded jobs. However, the ABMs were unpopular because they did not provide sufficient resources and kept workers dependent on additional measures. The ABMs also had a negative impact on the primary labor market because the jobs supported gave participating employers an economic advantage. Moreover, workers were often stigmatized and discriminated against by firms and society in general, therefore reducing their confidence and well-being and their chances of getting a good job (Oschmiansky 2020a). Consequently, the ABMs ceased to exist in 2012 (see Section 5.3.2.2).

Training programs

The promotion of continuing education in Germany includes measures to support vocational training, address associated costs (e.g., transportation, food, and accommodation), and expand and develop the vocational training infrastructure (Kühl et al. 2013). Until 1981, the majority of the people receiving support were employed before entering a training program, but this trend reversed significantly thereafter (Kühl et al. 2013). With the labor market reform in 2004, vocational training for employed and unemployed people was merged.

Vocational training plays an important role for JT, as it increases the chances that workers and residents of coal regions will find jobs outside the coal sector. Despite the lack of aggregated data for coal regions, national estimates show that, for training courses lasting less than six months, the probability of transitioning to unsubsidized employment is 55.3% higher for men and 40.2% higher for women than for people who have not completed a training program. Completing longer training courses has an even stronger positive effect on the probability of entering unsubsidized employment

(men 78.3%, women 61.0%; Kühl et al. (2013)). Early planning by employment agencies and mining companies is key to identify workers suitable for specific jobs and training. In Germany, the NEA regularly publishes a list of professions with a shortage of skilled labor, including jobs related to mining skills. These jobs are not necessarily in the mining regions. Hence, workers willing to relocate need to be identified to receive individual training for their new employment, especially with the upcoming coal phaseout (Knuth 2019, 80).

Job-seeking assistance

The role of job-seeking assistance is to link job seekers with vacancies, which is crucial to the restructuring of the labor markets in coal regions. In Germany, job-seeking assistance is handled by public agencies (employment agencies and job centers) and, since 1994, also by private agencies (Obermeier and Oschmiansky 2014). Employment services are generally available free of charge to both unemployed and employed people (Oschmiansky 2020b). Between March 2019 and February 2020, 2.1 million unemployment insurance recipients (see Section 3.1.1) were placed in a job (half after only one appointment at the employment agency), and about 400,000 income support recipients were placed (one-fifth after only one appointment at the job center). Approximately 40% of income support recipients are placed in a job after undergoing an analysis of their employment potential and receiving a vocational reintegration plan (Obermeier and Oschmiansky 2020). Job seekers can receive support from the NEA or job centers in the form of assistance with job placement, including reimbursement of application costs, travel expenses for interviews, mobility assistance for jobs in other regions (e.g., travel, separation, and relocation allowances), and allowances for work clothing and equipment.

3.1.3. Regional equalization system

Another important baseline policy for JT in Germany is its strong regional equalization system (*Länder*finanzausgleich). This means that tax revenues are distributed in ways that favor fiscally weak regions (Bundesministerium der Finanzen 2018), thereby improving the capacity of regions affected by the decline in coal production to finance social services and the maintenance of public infrastructure, among other functions relevant for JT for workers and local communities. Germany has a strong interregional revenue transfer system (Werner 2018; Blöchiger et al. 2007) and one of the highest levels of fiscal decentralization in the European Union (European Committee of the Regions 2021). This is important for JT given that coal regions affected by the decline in production normally face significant revenue reduction. Therefore, despite the GRW and EU Structural and Investment Funds being the most important regional development policies in Germany (see Sections 5.7.1 and 5.8.1), the system of fiscal equalization plays an important role in reducing fiscal imbalances between coal regions and the rest of the country (OECD 2019a). This strengthens the institutional capacity of local governments to develop and administer JT policies more effectively.

The regional equalization system takes place through three mechanisms: (1) vertical distribution of tax revenues, (2) horizontal distribution of tax revenues, and (3) supplementary national grants.

Vertical distribution of tax revenues

The first fiscal capacity of the *Länder* and local governments is their right to collect and use specific taxes. The national government collects excise duties, insurance tax, and the surtax on income tax and corporation tax. The *Länder* collect inheritance taxes, the beer duty, and the gaming casinos levy. Municipalities collect trade and real property taxes. These account for around 14%, 3%, and 9%, respectively, of Germany's total tax revenues. The remaining 73%, which corresponds to shared taxes, is almost equally divided between the national and *Länder* levels, with a smaller percentage for municipalities. This includes income taxes (42.5% national, 42.5% *Länder*, 15% municipal), taxes on interest and capital gains (44% national, 44% *Länder*, 12% municipal), corporation taxes (50% national, 50% *Länder*), and VAT (48.9% national, 47.7% *Länder*, 3.4% municipal). In the end, the national level accounts for around 42% of total tax revenues (322.4 billion in 2018), and the *Länder* and municipal governments account for 54% (Bundesministerium der Finanzen 2020, 22). In 2020, an important reform was implemented, allowing a greater distribution of VAT revenues to the *Länder* level (GIZ 2018).

Although coal mining in Germany is exempted from paying mining royalties, the decline in production has led to important trade and property tax shortfalls for municipalities in coal regions (DIW Berlin et al. 2019, Chapter 4). This is particularly relevant for many regions in which the lignite industry remains the primary source of local tax revenues (Michel 2018). However, the horizontal distribution of tax revenues has partially compensated for this effect.

Horizontal distribution of tax revenues

Horizontally, the basic principle of tax distribution in Germany is to reflect local revenues (incomes from residents and companies). However, *Länder* with below-average tax revenue receives a higher share of revenues from VAT. Up to 25% of the *Länder* share of VAT is distributed among the *Länder* that are more fiscally weak (Bundesministerium der Finanzen 2018). This horizontal distribution takes place at the level of the *Länder* and within each of the *Länder* at the municipality level.

In the 2020 reform, horizontal distribution among the *Länder* was abolished in favor of a "fiscal capacity equalization" program based on an equalization calculation in the VAT allocation, a new form of vertical equalization with horizontal effects (GIZ 2018). This reform also increases fiscal revenues for the *Länder* and responsibilities of the national government.

One advantage of a tax-sharing system for coal regions is that it ensures more stable revenues because local tax revenues are not as strongly impacted by economic fluctuations (Werner 2018). Moreover, this equalization system involves relatively lower levels of tax autonomy of the *Länder* and municipalities, an approach that discourages

downward tax competition as a way of attracting economic activity (Börzel 2001). This is important because tax benefits are not commonly employed in Germany to promote economic development in coal regions, which are more dependent on the economic situation of the whole country.

Supplementary national grants

The poorest *Länder* also receive supplementary national grants to decrease gaps that remain after the other equalization instruments are implemented (Bundesministerium der Finanzen 2018): general supplementary national grants (for *Länder* whose financial capacity after equalization is less than a certain per capita average) and supplementary national grants to address specific needs (for *Länder* with special burdens independent of their financial capacity). One of these areas of need is structural unemployment, which is particularly relevant for coal regions. Supplementary grants were also provided since reunification to compensate former East German *Länder*, therefore also helping lignite regions in this part of the country. These grants are uncommitted funds to meet general financial requirements and normally pay for administrative costs (Bundesministerium der Finanzen 2018).

3.2. The overarching regional structural policy approach for a just coal transition

Since the 1950s, structural policy (Strukturpolitik) has been one of the central concepts used by Germany to assist coal regions. This concept combines (a) industrial policies that promote economic activity through public interventions and (b) regional development policies that promote the economic growth of subnational regions affected by economic decline (also called "structurally weak regions" or regions affected by "structural change") (Gärtner 2019). The notion of structural policy has also been widely used by EU policymakers. The Structural and Investment Funds, for example, are one of the EU's main structural policy instruments. They include funds that support regional economic and social development (Masuch et al. 2018; Beugelsdijk and Eijffinger 2005). All four types of JT policies discussed in this report (economic diversification and reorientation, workforce support, social well-being and quality of life, and environmental remediation and protection) need to be understood as operating within this overarching regional and structural policy approach.

Although the definition of structural policy in Germany has evolved over time, the general goal is to promote systematic transformations in the economic environment of regions affected by economic decline (Gärtner 2019). Given the impacts of the decline in coal production on the economic structure of coal regions, structural policies have played a fundamental role in JT. Particularly important for JT are the following seven characteristics of these policies.

3.2.1. Creating integrative policies

Most policies implemented in Germany to support coal regions have addressed different challenges in tandem, thereby focusing on more than one of the four policy types.

Despite the predominant focus in regional structural policy on the use of physical infrastructure and private investments to promote economic development, a more holistic approach that began in the 1990s gives more importance to social and cultural aspects, such as the well-being and quality of life of local communities as well as environmental issues.

Moreover, rather than starting from scratch, many of the German policies combine existing programs and funding in a broader package to assist local businesses, workers, and communities. Bundling different national, subnational, and EU funds and programs, including some of the baseline policies described earlier, is important to avoid duplication of efforts, create synergies, and provide better coordination.

3.2.2. Focusing on investment-intensive interventions

Regional structural policies involve large expenditures. For example, the largest policy covered in this report in terms of funding is Development Program Ruhr (DPR), which allocated DM17 billion (€8.7 billion; 16% of the GDP of NRW in 1970) between 1968 and 1971 (Statista 2020). A smaller policy is FICSR, which allocated DM2.1 billion (€1 billion) between 1987 and 1991 (Goch 2009, 158), 0.6% of the GDP of NRW in 1990 (Statista 2020). Table 3 summarizes the amount of funding and the source for each policy included in this report.

Table 3. Funding by Policy

Policy	Funding	Sources
DPR	DM17 billion (€8.7 billion), 1968–1971	NRW (majority), national government, Coal and Steel Union funds, European Community (European Recovery Program)
APR	DM6.9 billion (€3.5 billion), 1980–1984	NRW, national government, European Community
FICSR	DM2.1 billion (DM520 million per year), 1987–1991	NRW, national government, European Community (RESIDER [support program for steel regions], European Structural and Investment Funds)
IBAEP	DM5 billion (€2.5 billion), 1989–1999	Private sector, existing funding programs (NRW, national government, European Union)
AFTSC	€14.8 billion, 2007–present	National government, *Länder* governments, European Union
Regional development framework (only for GRW)	Approx. €72 billion, 1991–2017 €1.2 billion in 2020 (grants) €1.2 billion in 2020 (loan warranties)	National government and the Länder equally
EU support for Germany	Structural and Investment Funds (€27.9 billion, 2014–2020) European Agricultural Support (approx. €5 billion annually) "Horizon 2020" (€80 billion until 2020, EU wide)	European Union, co-financed by national, *Länder*, and municipal governments
CCCL	€2 billion per year for 20 years (2022–2042) for structural development	National government and the *Länder*

3.2.3. Developing material infrastructure

Investments to develop and modernize physical infrastructure are central components of the structural policies to support coal regions. Table 4 summarizes the types of infrastructure financed by the policies discussed in this report. Recently, structural policies have prioritized digital infrastructure, such as glass fiber cables and improved mobile phone networks, to increase the connectivity of coal regions.

Table 4. Examples of Infrastructure Investments

Policy	Examples
DPR	**Transportation**: highways, road networks, railway system improvements, public transportation, waterways. **Urban development**: urban renewal, urban cultivation (i.e., creation of green areas, forest cultivation). **Education**: schools, universities, training infrastructure. **Health**: 15 large hospitals. **Cultural and social infrastructure**: regional recreational center (i.e., five amusement parks, a water reservoir, sport and swimming facilities, areas for outdoor recreation); community centers.
APR	**Urban development**: urban renewal, construction of parks, conversion of industrial buildings into living spaces. **Education**: expansion of middle schools and establishment of public educational institutions. Cultural and social infrastructure: construction of parks, recreation and sport facilities, museums.
FICSR	**Transportation**: highway system extension and improvements, extension of railway system, connection of airports to other transportation systems. **Urban development**: urban renewal, creation of new architectural projects. **Disposal and sewage systems**: refurbishment of the sewage system, renewal of the waste disposal system (particularly for industrial waste).
IBAEP	**Urban development**: urban renewal, housing construction and renovation, construction of public parks, tree planting, promotion of new architecture, redevelopment of former industrial sites. **Cultural and social infrastructure**: creation of outdoor recreation facility in former waterway used for coal transport (Rhine-Herne Channel), development of sport facilities, creation of museums and cultural sites.
AFTSC	**Urban development**: creation of an urban district in former mining areas (Freiheit Emscher project). Cultural and social infrastructure: creation of a center of postmining activities (Pluto center).
Regional development framework (only for GRW)	**Digitalization**: expansion of digital infrastructure (e.g., broadband). Urban development: urban renewal and sustainable urban infrastructures.
EU support for Germany	**Transportation, energy infrastructure, and digitalization** (specific infrastructure support remains to be determined).
CCCL	**Transportation**: improvement of infrastructure for the supply of goods, mobility, and communication systems. **Digitalization**: expansion of digital infrastructure, modernization of internet and mobile phone networks.

3.2.4. Creating regional cohesion

Another key component of regional structural policies is regional cohesion, the goal of which is to ensure equivalent living conditions among subnational regions; this is part of the German constitution (Bundesministerium der Justiz und für Verbraucherschutz 2021). Therefore, rather than promoting competition among regions to attract businesses, workers, and funds, the regional cohesion principle seeks to address disparities among regions by targeting the less well-off (Gäbler 2020). In 1969, Germany introduced the GRW, a nationwide policy implemented by the different *Länder* to support investments in structurally weak regions, such as the Ruhr area. The GRW represents a crucial redevelopment policy for coal regions (see Section 5.7.1.1).

Regional cohesion is also an important objective for the European Union, which has implemented several policies to reduce gaps in economic growth and quality of life in subnational regions of its member states (Beugelsdijk and Eijffinger 2005). The European Union has allocated about €367 billion, which represents 34% of its total budget, to address cohesion policy objectives between 2014 and 2020 (Darvas et al. 2019). Policies that have been especially beneficial for coal regions include RESIDER (a support program for steel regions) and RECHAR (a support program for coal regions; 1989–1999), and the European Regional Development Fund, European Social Fund, and European Cohesion Fund, which are still being implemented.

3.2.5. Tailoring to the local context

An important dimension of designing effective regional structural policies is ensuring that they are aligned with local realities and needs. This involves considering existing economic activities that can be strengthened as well as potential activities tailored to regional skills, physical infrastructure, and geographical features.

Designing and implementing policies at the *Länder* and local government levels, which have been the key levels prioritizing specific investments, is an important approach to create more locally coherent policies. An important tool is local actors' development of long-term economic forecasts and plans to guide the definition of programs and allocation of resources in the regions (see, for example, FICSR, Section 5.4, and CC, Section 5.9).

Moreover, regional economic plans developed as part of some of the policies examined in this report have often included local participants, such as representatives of local businesses, workers, research institutions, and governments (see Section 3.7.2). Public participation ensures not only more procedural justice, in line with the JT guidelines of the International Labour Organization and other international institutions (Just Transition Initiative 2020; ILO 2015), but also more locally coherent interventions.

3.2.6. Supporting local governments

Regional structural policies in Germany have commonly seen local governments as key engines for regional development. Moreover, given decreasing local revenues associated with the decline in coal production, support for local governments represents a central area of intervention by, for example, increasing their capacity to invest in local infrastructure and social programs (see APR, Section 5.3, and IBAEP, Section 5.5). Some policies have provided direct investments in regional and municipal administrative structures to strengthen their administrative capacity (see, for example, APR, Section 5.3). Similarly, the CC recommended strengthening the public sector in mining regions by extending the presence of public institutions, agencies, and offices (see CC, Section 5.9).

3.2.7. Shifting from a reactive to an anticipatory approach

Rather than trying to prevent structural change, structural policies in Germany have provided "a framework to manage its consequences" (Gärtner 2019, 135). This reactive approach is shared by most of the policies covered by this report. However, since the enactment of the AFTSC in 2007, a more anticipatory approach has gained relevance. An anticipatory approach is important to ease the disruptiveness of declining coal production. For example, it can help coal workers to make timely reeducation and employment choices and can contribute to gradual reduction of the workforce as workers age out and no additional workers are hired (DIW Berlin et al. 2019).

The AFTSC and the CCCL show that anticipating the effects of phasing out coal can promote more effective planning of post-coal economic activities and job prospects. Both policies also show that an anticipatory process can create more social acceptance among businesses, workers, and communities of the need to address the reality of the coal phaseout, thereby accelerating the process (Oei et al. 2019). However, the AFTSC and CC are also relatively unambitious phaseout policies with regard to climate protection for a rich country in which coal production has been uneconomical for decades. Nevertheless, they provide good examples of how a planned transition can be negotiated and achieved in a timelier manner in other contexts.

3.3. JT policy type 1: Economic diversification and reorientation

The first policy type identified in this review includes initiatives to diversify the economies of coal regions and reorient their labor productivity away from coal. Even though the first policies implemented in Germany to support coal regions aimed at the conservation of coal production (see Box 3), economic diversification was also a key component. In these policies, diversification was understood as lowering the dependence of regions on coal production by promoting new economic activities.

In the late 1980s, economic reorientation gained more relevance. The FICSR was the first policy that focused on reorienting the economy away from coal rather than on promoting economic diversification and simultaneously protecting the coal and steel sectors (Sachverständigenrat 1988, 197).

Table 5 summarizes the main initiatives and mechanisms to promote economic diversification and reorientation in each policy, described in the following subsections.

3.3.1. Business attraction and support

Policies to support coal regions in Germany have heavily invested in initiatives to attract new businesses and financially support existing local enterprises beyond coal. The first policies to attract new businesses (DPR and APR) did not explicitly target any economic sector. However, a preference for manufacturing activities was common.

These policies also targeted large companies with the aim of promoting coal regions as competitive areas for business location (Arndt et al. 2015, 101; Goch 2009, 147). Large shares of the funds were allocated to strengthen the coal sector, which prevented a faster transition away from coal and did not prove as successful (Sachverständigenrat 1988, 194). Over time, the focus changed toward small and medium enterprises (SMEs) to reduce local dependence on a few large companies for revenues and employment.

Table 5. Initiatives to Promote Economic Diversification and Reorientation

Goals	Applied mechanisms	Examples	Policies
Business attraction and support	Financial support for new businesses	Investment support (loans, tax cuts, pledges, debt repayment schemes)	DPR, APR, FICSR, regional development framework, CCCL
	Services and assistance for firms	Network-building, country counseling for exporting companies	Regional development framework
	Financial support for public and nonprofit organizations	Land acquisition (subsidies), construction of local infrastructure, reconversion of office buildings	APR, IBA, FICSR
	Service and assistance for public and nonprofit organizations	Assistance in creating development strategies and networks	CCCL
Expansion of educational activities	Financial support for public organizations	Implementation and extension of universities and training centers	DPR, APR, FICSR, regional development framework, CCCL
Development of technology and innovation	Service and assistance for local organizations	Creation and support of networks between firms and research institutions; assistance for universities in applying	FICSR, regional development framework, CCCL
	Financial support for businesses	Investment support for R&D	APR, FICSR, regional development framework, CCCL
	Service and assistance for firms	Innovation transfer between research and firms	APR, FICSR, regional development framework, CCCL
	Financial support for public organizations	Support for universities for research and innovation in (clean) energy technologies	DPR, APR, FICSR, regional development framework, CCCL
Preservation of the energy role beyond coal	Financial support for businesses	Support for universities for research and innovation in (clean) energy technologies	DPR, APR, FICSR, regional development framework, CCCL
	Service and assistance for firms	Networks between universities and firms	CCCL
	Financial support for public organizations	Support for universities for research and innovation in clean energy technologies	CCCL

Box 3. Failures of Conservation Policies (Policies to Extend Coal Production)

The first policies implemented in Germany to assist coal regions affected by the crisis of the late 1950s aimed at protecting the coal industry by stimulating production. This was the case for the DPR (1968–1971) and APR (1980–1984), in which regional structural policy was understood as an instrument to mitigate the impacts of the crisis by resisting structural change. Moreover, the national government subsidized the sale of domestic coal from the late 1960s until 2018. These policies slowed the decline in production and employment. However, they were unable to reactivate the coal economy in the Ruhr area (Oei et al. 2019). These "conservation policies" have been criticized for increasing the dependency on coal (Wuppertal Institut 2013; Herpich, Brauers, and Oei 2018). Moreover, they preserved uneconomical and environmentally harmful industries, wasting resources that could instead have been used for an earlier structural transformation. Although these policies included the objectives of economic diversification and decreasing local dependency on coal, these objectives were not successfully achieved. Powerful coal and steel companies and unions were able to resist the decline, despite increasing competition from and public support of other economic sectors, through processes that are commonly described in the literature on energy transitions as "lock-in mechanisms" (Unruh 2000). In the Ruhr area, this resistance involved institutional lock-ins (network of companies, politicians, and unions resisting the decline in production), economic lock-ins (high local dependency on the mining industry), and cognitive lock-ins (the belief that the crisis was cyclical rather than structural) (Goch 2009; Hospers 2004). Another lock-in mechanism was the "ground lock," in which mining companies refused to sell land to new companies out of fear that they would increase competition for local employees and raise salaries. In the 1960s, ground lock prevented, for example, the establishment of the Ford Motor Company in the localities Herten and Hamm (Oei et al. 2019).

Moreover, the original focus on attracting existing large companies was criticized for not considering local potentialities. The GRW was the first policy to include promoting SMEs among its priorities (Arndt et al. 2015, 101).

Land acquisition and renewal of former industrial sites have been important instruments to attract businesses to coal regions, especially because during the implementation of the DPR, a lack of land available for commercial purposes was a barrier for the attraction of new businesses, particularly large industries, to the Ruhr area (Mikat et al. 1989, 378).

3.3.2. Expansion of educational and research activities

Extending the offerings of educational and research programs and institutions in coal regions is another mechanism used in policies promoting economic diversification and reorientation. The goal is to contribute to the formation of a specialized local workforce in areas not related to coal. The DPR was particularly important in this regard with its expansion of the university system in the Ruhr area. Five universities and several research institutes were funded in this region during the 1960s and 1970s (Keil and Wetterau 2013, 40), and today the Ruhr area represents one of the most university-dense regions in Europe (metropoleruhr 2021).

By expanding educational institutions in coal regions, these policies have also contributed to the formation of tertiary activities and to the growth of local consumption by attracting students and scholars to the region (Keil and Wetterau 2013, 40).

3.3.3. Development of technology and innovation

The promotion of technology-intensive economic activities and jobs has been a key feature of German policies to assist coal regions, particularly since the implementation of technology programs in the 1970s (see Section 5.3). Moreover, since the APR was enacted, the promotion of start-ups, innovation, and forward-looking technologies in industries besides coal has gained relevance. The main tools used by these policies are financial support for R&D and technology transfer. Another important tool that gained relevance in the 1990s is the promotion of technological clusters, which are local networks for collaboration between research and academic institutions and the private sector (see Box 4).

Since the 2000s, the goal of transforming coal regions into hubs for the development of green energy technologies has gained relevance. Priority has also been given to the development of digitalization and automation technologies. A focus on strengthening existing regional potentials and clusters, rather than promoting new economic activities in the Ruhr area, has been gradually incorporated and has become the main focus of the policies to support technological development since the 2000s (Keil and Wetterau 2013, 40).

Box 4. Technology Center of Dortmund

In 1985, the Technology Center of Dortmund, the third-largest city in NRW, was built to support technology companies and start-ups. The center supported the setup of new leading industries and start-ups, strengthened local companies, and expanded training opportunities and research activities. It has become one of the leading technology centers in Germany, developing high-potential technologies such as information and communications technologies, biomedicine, and microsystems. The center has supported more than 300 companies employing more than 10,000 people and promoted cooperation between local companies, universities, and scientific institutions. It is located in the Technology Park Dortmund, which was built in 1988 and is one of Europe's largest technology parks, with more than 20,000 employees. Today, the Technology Center Dortmund represents a good example of successful investments in research and technology that have been supported through funds included in policies to support the Ruhr area (Becker and Herrmann 2013).

3.3.4. Conserving a focus on energy

Conserving the role of coal regions as energy regions has been a common goal of policies to promote economic diversification and reorientation. The aim is to take advantage of existing infrastructure, knowledge, and expertise for the development of economic activities related to non-coal energy production.

The APR, for example, provided special support for research and development in nonconventional oil extraction and district heating (Landesregierung NRW 1979, 25f). More recently, the focus has shifted to renewable energies. Despite a lack of empirical evidence supporting the economic effectiveness of policies that prioritize investments to maintain these regions' energy role, one CC recommendation is to promote the development of coal regions as "energy regions equipped for the future" through investments and R&D in clean energy technologies (e.g., renewable energies, energy

efficiency, storage capacity, and green hydrogen) (BMWi 2019).

Some initiatives have also promoted the formation of local expertise in the energy transition, including its technological, economic, social, and environmental aspects. Institutions developing multidisciplinary research on these topics in coal regions include the Structural Transition Institute in Halle, the Max Planck Institute for transformation research in Rhineland, and the Saxon Institute for Energy and Transformation Research in Lusatia.

3.4. JT policy type 2: Workforce support

In Germany, labor market policy is mainly the responsibility of the national government. Hence, strategies at the *Länder* level only complement the national framework to support workers (see Section 3.1.2.3 and Table 6). However, the JT policies analyzed in this report include three main strategies to complement the national framework: integration of labor market policies into regional development policies, co-financing of job procurement and employment measures, and investment in training and qualification infrastructure (Matzdorf 1994).

3.4.1. Integration of labor market policies into regional development policy

The first strategy involves integrating labor market policies into policies that promote the development of coal regions. An important way of achieving this has been the definition of "regional development concepts," or development plans that set the main infrastructure and investment goals of each region (see, for example, DPR, APR, FICSR, CC). This planning tool facilitates the coordination between different government levels and the private sector to define the demand for a qualified workforce and therefore to adjust national qualification programs in line with regional needs.

Regional development programs in coal regions have increasingly included local participation and specialized studies to align development strategies with existing workforce capacities and needs (e.g., FICSR, IBAEP, CC). Planning for the upcoming coal phaseout has included individual development strategies by the regions, which facilitate long-term planning in the labor market to design qualification strategies (see Section 5.9.1.3).

3.4.2. Financing or co-financing job procurement and employment measures

The second strategy involves the *Länder* governments co-financing existing national labor market measures. For example, the APR contained additional funds for the extension of the ABMs (see Section 5.3.2.2) in regions affected by structural change and with higher unemployment rates, which enabled a longer funding period (three instead of two years for ABM participants).

Moreover, most of the policies examined in this report involved large-scale investments in infrastructure, which directly created jobs associated with the construction and operation of these projects (see, for example, DPR, Section 5.2, and APR, Section 5.3). While these jobs have sometimes been temporary (e.g., the building of physical infrastructure, decommissioning projects, or environmental remediation), more permanent jobs have sometimes been established (e.g., in new educational institutions, hospitals, or recreation facilities). Moreover, these policies have also created jobs directly associated with some of the services provided (e.g., in vocational information centers and training programs) and funding to strengthen local governments.

3.4.3. Extension of qualification and career counseling infrastructure

The third strategy involves extending certain national qualification measures into coal regions. For example, some regional development programs contained measures to develop education and counseling infrastructure in NRW (e.g., DPR, APR, IBAEP, CC). Besides the formal education system, some regional programs extended the qualification and career counseling infrastructure (e.g., DPR, APR, regional development policy framework, CC) and/or financed training and education of staff.

An additional benefit of measures to promote higher education and training, especially during the 1970s, was to reduce the number of workers seeking jobs during their period as students or apprentices (see, for example, DPR, Section 5.2, APR, Section 5.3, and regional development policy framework, Section 5.7). Individuals born in the generation of high birth rates after World War II entered the workforce when the Ruhr area was facing increasing unemployment rates. Enabling some of them to study took some pressure off the labor market, as it delayed their entry into the workforce (see APR, Section 5.3).

The main costs of qualification and training measures are covered by the national labor market policies, which are generally supervised by the NEA. However, some mining regions have needed additional measures. Therefore, from the mid-1960s to the mid-1980s, allowances for qualification and training of miners were co-financed by the mining *Länder* via additional programs (e.g., DPR, Section 5.2). After the 1980s, the national government continued financing these measures without the co-financing from the *Länder*. The 2007 hard coal phaseout strategy included social plans (agreements between the mining companies and workers on how to structure the decline of employment in the companies), which also included agreements on covering the costs for qualification and training measures for miners willing to transfer to other jobs.

Table 6. Mechanisms of Worker Support

Goals	Mechanisms	Examples	Policies
Allowances	Financial support for workers	Wage subsidies, waiting allowances for unemployed workers, transitional aid, rent subsidies	National baseline labor policies
	Service and assistance for workers	Help with application for allowances	National baseline labor policies
	Financial support for firms	Subsidies for paying the employers share of the allowances	AFTSC, CCCL
Training programs	Financial support for workers	Allowances for training (payment for training, wage subsidies, insurance)	National baseline labor policies
	Service and assistance for workers	Counseling for workers for training programs	National baseline labor policies
	Financial support for firms	Subsidies to pay the employers share of training allowances for workers	AFTSC, CCCL
	Financial support for public organizations	Investment support for creation and extension of training facilities	DPR, APR, FICSR, IBAEP, regional development framework, CCCL
Job-seeking assistance	Service and assistance for workers	Counseling for workers to find suitable jobs	National baseline labor policies
Job creation	Financial support for public organizations	Payments to firms for employing unemployed people	National baseline labor policies
	Financial support for firms	Financial support for firms creating jobs	DPR, APR, FICSR, regional development framework
	Direct investments	Jobs in environmental remediation	DPR, APR, FICSR, IBAEP

3.5. JT policy type 3: Social well-being and quality of life

Many German policies to assist coal regions include initiatives to improve the living conditions of regional inhabitants through urban development and renewal and by promoting culture, leisure, and recreational activities. These policies see improvements in social well-being and quality of life as not only important final goals but also mediums to promote regional economic growth. For example, better living conditions can improve the public perception of mining regions, thereby reducing emigration and attracting businesses, workers, and tourists.

In recent decades, improving the quality of life of coal regions has gained relevance as a way of creating social cohesion, given that the feeling shared by many coal workers and residents of coal regions of being left behind by Germany and the European

Union's economic and climate policies (Morton and Müller 2016) has been one of the catalyzers of polarization and populism in coal regions in recent decades (Abraham 2019).

Table 7 summarizes the main mechanisms employed to improve social well-being and quality of life, each of which is further described in the following subsections.

3.5.1. Urban development

Initiatives to promote urban development have always been part of the policies implemented in Germany to support coal regions. Although the main goal of the first policies (DPR and APR) was to attract new businesses through the renewal of industrial sites, the FICSR and subsequent policies have placed greater emphasis on the development of residential projects and on the creation, renewal, and improvement of public areas and infrastructures.

A policy that stands out for putting urban development at the center is the IBAEP. It created several projects to redevelop former industrial sites into architecturally attractive and ecologically sustainable working spaces. To improve the quality of life in the region and increase its attractiveness, the IBAEP also developed housing projects to preserve local architectural heritage, public parks, recreational areas, urban gardening, and projects to improve the natural landscape (Reicher et al. 2008, 7).

3.5.2. Culture and leisure

In direct connection with urban development, policies to support coal regions in Germany have promoted cultural and leisure activities by developing and modernizing physical infrastructure. This approach of the DPR and later policies has involved constructing amusement parks, sports facilities, and outdoor recreational areas.

Former industrial sites have been environmentally remediated and converted into museums, historical amusement parks, and outdoor recreational centers. Particularly famous was the project implemented under the IBAEP to convert the Rhine-Herne Channel, formerly used for coal transportation, into a recreation zone. Moreover, since the IBAEP, more importance has been given to enhancing mining heritage, such as through the preservation of industrial monuments, the creation of a mining museum (German Mining Museum Bochum), and support for the preservation of cultural mining traditions. Since the APR, policies have also included economic support for cultural activities, such as art exhibitions, performing arts, and cultural education projects.

Table 7. Mechanisms of Social Well-being and Quality of Life

Goals	Mechanisms	Examples	Policies
Urban development	Financial support for public organizations	Modernization of municipalities (e.g., buildings, parks)	APR, FICSR, IBAEP, regional development framework
	Financial support for companies/people	Modernization of houses	APR, FICSR, IBAEP, regional development framework
Culture and leisure	Financial support for public organizations	Construction/creation and operation of cultural and leisure facilities	DPR, APR, FICSR, IBAEP, AFTSC, CCCL

3.6. JT policy type 4: Environmental remediation and protection

Most policies covered by this report include measures to remediate and protect the environment, especially through the cleanup of previously contaminated industrial sites and air and water pollution control in coal regions (see Tables 8 and 9). These have been important goals to improve the quality of life and attractiveness of the regions (see, for example, IBAEP, Section 5.5).

Despite the polluter-pays principle in Germany's law, public support has usually been needed to finance environmental remediation, given that polluter companies were out of business or unable to afford these projects (Harfst and Wirth 2011). Loans, tax cuts, subsidies, and direct investments have been made available to finance these measures. Anticipatory policies, such as the AFTSC and CCCL, have placed greater emphasis on environmental protection. However, they are also based on large public funds to implement these measures.

Another way of incorporating environmental protection in the analyzed policies is by adding it as a criterion for the selection of projects. For example, in the IBAEP, projects had to meet high environmental and sustainability standards to be eligible for funding. The CC also uses environmental sustainability as a benchmark for projects (BMWi 2019).

3.6.1. Decommissioning and environmental remediation

In most of the historical policies covered by this report, decommissioning hard coal mines was motivated not by environmental protection but rather by economic efficiency. Coal companies received decommissioning premiums to increase efficiency by reducing production capacities (Storchmann 2005, 1482). The first policies also promoted decommissioning to remediate the environmental impacts caused by downstream industrial sectors in the Ruhr area, such as the steel industry. Companies also received decommissioning premiums, loans, and tax benefits to improve air pollution control (see DPR, Section 5.2, and APR, Section 5.3).

The land in the Ruhr area was highly contaminated by industrial activities, and, in many cases, the polluters no longer existed or could not be identified. Therefore, during the implementation of the APR, the state of NRW set up the Land Development Agency (LDA), which oversaw the remediation of contaminated industrial sites. Most of these sites were remediated not to greenfield (pre-project) conditions but rather to brownfield conditions and sold for commercial and residential uses.

In the case of lignite, environmental remediation projects have sought the renaturation of opencast mines, many of which have been converted into lakes. Although the associated costs should theoretically be paid by the operators, most of these projects have been publicly financed (Harfst and Wirth 2011). Recently, under expectations that coal will be phased out, lignite companies have gone into radical restructuring and divestiture processes as a way of securing their business from environmental liabilities (Hörnlein 2019).

3.6.2. Water management

Water management has been of central importance for the environmental remediation of coal mines, especially the treatment of groundwater systems. Given the need for continuous management and monitoring of water systems after mining activities are concluded, this environmental liability is considered a "perpetual obligation" (Ewigkeitsaufgaben) in the AFTSC. To ensure financing of these perpetual obligations, the RAG Foundation was established, using part of the assets of the former RAG mining company as well as assets from nonmining investments (see AFTSC, Section 5.6).

The management of surface water has also played a major role in the environmental remediation of the Ruhr area. Comprehensive measures were implemented in the 1990s to clean the river systems of the region and to channel and treat wastewater through a newly built underground sewage system (see, for example, FICSR, Section 5.4, and IBAEP, Section 5.5).

3.6.3. Others

Other environmental measures involve the greening and forestation of stockpiles or other industrial areas. Various programs (see, for example, DPR, Section 5.2; APR, Section 5.3; and IBAEP, Section 5.5) included these measures in combination with programs to enhance employment.

3.7. Governance structures

Policies to support coal regions in Germany have employed a variety of governance structures related to the different actors and institutions in charge of their design and implementation, as well as the levels and forms of stakeholders' participation in the different stages of these policies (see Table 9 for a summary).

3.7.1. Design

The first policies to support coal regions were designed top-down, especially at the *Länder* level. In policies such as the DPR, the APR, and the technology programs, the *Länder* institutions defined the investments and projects, with little input from local actors (Galgóczi 2014, 228). The design of these policies included every measure to be implemented (e.g., which factory to retrofit or where to build a level crossing). This specificity might have been useful because of the lack of bodies to coordinate the measures between different authorities at that time (see DPR, Section 5.2). However, these first large projects were met with significant local resistance from the coal and steel industries (Wissen 2000, 53).

With the increasing regionalization of development policies in Germany, through which municipalities in coal regions were given more leeway to better tailor measures to their strengths and weaknesses, the policies became more flexible. For example, their initial design contains only a general framework to set the conditions for funding individual projects, which are then selected and approved at the regional level and implemented at the local level (e.g., IBAEP, regional development framework). Moreover, planning mandates have been increasingly delegated to municipal actors, which started to participate in strategic planning processes (e.g., Ruhr Conference) (Klute 2015). In the 2010s, cities within the Ruhr area became more empowered to create their own development strategies reflecting their individual strengths and needs (Oei et al. 2019).

3.7.2. Implementation

In Germany, different political levels (the European Union, the national government, the *Länder*, and the municipalities) have been involved in the establishment and administration of the policies to support coal regions (see Box 1). Regional development and economic promotion are mainly the responsibility of the *Länder*, so the *Länder* were responsible for most programs. However, programs implemented at the *Länder* level were always coordinated with the municipal, national, and EU levels to facilitate funding and linkage with other measures, such as supraregional infrastructure projects or employment promotion.

The most common governance approach in these policies was top-down and centralized, with the *Länder* and their offices responsible for their administration. Since the 1990s, responsibility has shifted to the regions (Oei et al. 2019). The shift to the municipal level for the design and implementation of these policies requires increased coordination, as the approach becomes more and more polycentric, also including the level of the European Union.

During the 1990s, the IBAEP prioritized coordination between cities in the Ruhr area, given its cooperative management structure. In 2007, the Ruhr Regional Association (Regionalverband Ruhr), the regional planning institution for the Ruhr area, gained planning functions; since then, cooperation among cities has been increasingly promoted. This also improved coordination of national funds and reduced intermunicipal competition (Keil and Wetterau 2013, 97). Moreover, given that coal

regions do not necessarily align geographically with the administrative levels at which policies are designed and implemented, this institution provides more coherence to regional conditions. In 2020, residents of the Ruhr area were allowed for the first time to vote in elections for the Ruhr Parliament, which is the head of the Ruhr Regional Association (RVR 2020).

Table 8. Mechanisms of Environmental Remediation and Protection

Goals	Mechanisms	Examples	Policies
Decommissioning and environmental remediation	Financial support for public organizations	Construction of sewage plants	DPR
	Financial support for firms	Tax cuts and allowances for air quality measures or decommissioning of industrial facilities and mining infrastructure	DPR, APR, FICSR, AFTSC
Water management	Financial support for public organizations	Safeguarding nature and water monitoring and cleaning (surface and in mines)	DPR, APR, FICSR, AFTSC
Other	Financial support for public organizations	Greening of stockpiles, restoration and extension of forest areas	APR, FICSR, IBAEP

3.7.3. Public participation

After initial difficulties of the DPR and APR in attracting larger industrial projects (Sachverständigenrat 1988, 190), the design and implementation of the development programs have increasingly relied on the involvement of local stakeholders. Initially, the top-down implementation of the programs was partly forced by the urgency of the measures in response to the economic crisis in the Ruhr region and the resulting high unemployment.

The existing industries' influence on the political processes was significant in the first programs, and the distribution of funding volumes was strongly concentrated on the coal and steel industries. This prevented structural change (see DPR, Section 5.2, and APR, Section 5.3). Bit by bit, public participation was implemented in the design of regional policies. Although the APR mostly followed a top-down approach, it was the first policy to include some local participation in the form of multistakeholder conferences in which representatives of communities, municipalities, workers, scientists, and churches discussed regional problems and solutions (see Section 5.3).

Since the late 1980s, policies in support of coal regions have become more decentralized, shifting the hierarchical focus from the national government to local actors. The first regionalized policy was the FICSR, which included in its governance structure the Coal and Steel Regions Commission, consisting of representatives from the private and public sectors, labor, local organizations, and research institutions. It assessed the needs and opportunities for the development of the Ruhr region, provided ideas for the design of these policies, and monitored their implementation

(see Section 5.4). By involving local actors in decisionmaking, the regions were able to benefit from endogenous potentials. Furthermore, the establishment of multistakeholder commissions and conferences contributed to the formation of more consensual assessments of the challenges in the regions, improved local policy

Table 9. Governance Structures by Policy

Policy	Design	Implementation	Public participation
DPR	Top-down design by the advisory group and *Länder* chancellery and offices.	*Länder*	Limited—top-down program.
APR	Top-down design by advisory group and *Länder* chancellery and offices, drawing on recommendations from local multistakeholder conferences.	*Länder*	Consultation with local stakeholders and experts via a two-day conference prior to the design of the program.
FICSR	Design according to the recommendations of a multistakeholder commission.	*Länder*	Consultation with local stakeholders and experts for the design of the policy. Participation of stakeholders via a multistage assessment process prior to the implementation phase.
IBAEP	Public–private planning company. Details of the program developed via projects selected by the multistakeholder grant committee.	*Länder*	Participation of local stakeholders via their own projects during the implementation phase. Consultations with selected local stakeholders.
AFTSC	Top-down decision by national and *Länder* governments.	National government	Hearings of selected (regional) stakeholders in the design process of the law.
Regional development framework	Top-down decision on criteria for the funding of the programs. Projects developed by individuals, municipalities, companies, etc.	National government, *Länder*, municipalities	No participation of local stakeholders in the design. Depending on the specific program within the regional development framework, participation via own projects was possible (private, companies, municipalities, institutions, etc.).
EU Support for Germany	Multilevel coordination (EU–national, national–*Länder*).	European Union, national government, *Länder*	No participation of local stakeholders in the design of the programs. The European Union and member states decide on the criteria for distribution of funds. The *Länder* decide on the funds granted to individual projects.
CCCL	Multistakeholder commission recommendations implemented on the national level.	National, *Länder*	Participation via representatives of relevant stakeholders in the Coal Commission. Hearings of experts and assessment of the region via field trips.

coherence, and promoted local cooperation (Wuppertal Institut 2013; Herpich, Brauers, and Oei 2018).

For the upcoming coal phaseout, the Coal Commission (CC) was implemented at the national level, with most of the relevant stakeholders represented. The commission's deliberations lasted six months and included the participation of numerous experts and field trips to the coalfields. Despite the CC's success in reaching a national multistakeholder agreement, a more top-down approach ultimately prevailed in the design and adoption of the coal phaseout law, leading to considerable criticism from various stakeholders, including many CC participants.

In addition to participating in the design of the programs, stakeholders can increasingly participate with their own projects to engage in structural change (IBAEP, regional development framework). In the IBAEP, residents of the region were invited to participate in workshops to define and discuss development projects. The IBAEP placed special emphasis on promoting project proposals from local institutions, mainly municipalities but also private companies, community organizations, health facilities, and others. Since then, not only local politicians, businesses, and workers but also actors from civil society (e.g., environmental and community organizations) have increasingly been involved in regional development policy design and decisionmaking (Dahlbeck and Gärtner 2019).

3.7.4. Public–private entities

Another characteristic of the governance of German policies to support coal regions is the creation of public–private and private entities to administer and implement some of these policies. For example, a public–private planning company, owned by NRW but ruled by private law, was created as part of the IBAEP. This company oversaw the policy's implementation by selecting and monitoring the projects that were financed. Its decisions were supervised by a board consisting of trade unions and representatives of key ministries of NRW, Saarland, and the national government. Another important example, related to the end of hard coal production as defined by the AFTSC, is the creation of the RAG Foundation. It uses its corporate profits and investment returns to finance environmental remediation and some of the structural transformation of the Ruhr area (see Section 5.6.2.1).

4. Lessons Learned

Germany's six decades of experience with policies to support workers and regions affected by the decline in coal production provide five main lessons that can inform JT policymakers in other countries:

1. **Adopting an anticipatory approach**. Since 1960, large amounts of public funds were used to slow the decline of the coal industry. However, in the 2000s, policies began to proactively steer the transition away from coal and make targeted investments in coal communities. This anticipatory approach, based on policy responses that try to prevent the expected negative social consequences of declining coal production (rather than respond to these impacts), promotes job creation and new industries in coal regions and protects the socioeconomic status of former coal workers. However, policies to phase out coal that are not in line with the Paris Agreement are not consistent with an anticipatory approach based on commitments for climate protection.
2. **Focusing on large-scale regional industrial policy.** Large-scale government investments and industrial policies have been central aspects of the approach to supporting German coal regions in transition. In the beginning of the German coal industry crisis during the 1960s, most of the investments tried to restrengthen or conserve the role of traditional industries, which prevented a transition and instead led to high levels of debt and public budget deficits. A new focus from the public sector in regional economic development was important for attracting businesses and promoting economic growth. Since the 1990s, these policies have incorporated a cluster approach to develop local networks of businesses and research institutions. There are no publications available with a comprehensive evaluation of all these policies. However, according to mandatory evaluations conducted on some programs (particularly GRW and the European Fund for Regional Development [EFRD]), these policies have had a positive effect by creating new economic opportunities and jobs in many of the locations where they have been deployed (IWH 2020; Bade and Alm 2010; Untiedt et al. 2010).
3. **Tailoring policy to local circumstances**. Policies to support coal regions have been particularly successful when tailored to local needs and realities. Top-down efforts to attract large companies failed as local resistance prevented a more positive transformation (see DPR, Section 5.2). Active participation of local stakeholders in designing and implementing JT policies is important not only from a procedural justice perspective but also to create more locally coherent and effective interventions. Incorporating local actors also increases social acceptance and the usage of existing regional knowledge, which are important to accelerate the transition away from coal. Moreover, the German experience also shows the importance of providing local governments with enough financial resources to implement these measures and to reduce coordination of efforts between the political levels. By giving municipal governments more financial and administrative autonomy, they can design, implement, and finance projects needed for the transition, reducing problems of coordination among different policy levels.

4. **Combining different policy objectives in an integrative approach**. Most policies to support coal regions combine multiple objectives. Since the 1990s, policies have prioritized the quality of life of local communities through economic, cultural, and environmental interventions. This integrative approach is important for addressing the transition away from coal as a multidimensional problem and for creating synergies between different interventions.
5. **Recognizing the importance of baseline policies.** The German social safety net system, the labor system, and the system of regional fiscal equalization are critical components in efforts to assist workers and communities affected by the decline in coal production. Given the relatively strong support that the German social safety net provides to coal workers, most policies included in this review should be seen as a complement to these baseline policies. Emphasizing the additionality of the JT policies is particularly important to avoid overestimating their potential replicability in other contexts with weaker social and labor protection systems. Improving these baseline policies is key not only to reducing the need for JT policies, but also to promoting more resilient economic and social institutions able to address the impacts associated with the transition away from coal and other upcoming economic transitions.

Although we can learn useful lessons from the German coal phaseout history, it is the opinion of the authors that the policy approaches used in this phaseout are not aggressive, holistic, or forward-looking enough to address the challenges that lie ahead. Specifically, challenges lie in transitioning from fossil fuels at a pace required to mitigate disastrous levels of climate change, while investing in the future prosperity of the fossil-energy workers and communities that fueled the twentieth century. Hence, the lessons learned from Germany and other countries' phaseouts need to be combined with new, fresh ideas to achieve a holistic JT management approach capable of responding to broader and faster decarbonization initiatives.

5. Appendix: Detailed Description of Policies

5.1. Historical overview

5.1.1. Coal pricing and production

After World War II, Germany set the price of coal at a low level to accelerate the reconstruction process. However, in 1956 the European Coal and Steel Community—the predecessor to the European Union—forced the German government to stop controlling coal prices. Hard coal production began to decline at the end of the 1950s, after the Suez Crisis ended and cheap imported oil flooded the market. Between 1957 and 1967, German hard coal production fell from 150 to 112 million metric tons per year, and employment in the industry fell from 600,000 to 287,000 people (Statistik der Kohlenwirtschaft e.V. 2019c; 2019d). During the crisis, the national government offered short-term jobs to 16,000 workers and early retirement to others. It also provided job search assistance, short-term cash benefits for job seekers, and retraining services. These measures were funded via a tax on imported oil and additional resources from the national and NRW governments, the European Coal and Steel Community, and mining companies (Farrenkopf 2009, 94).

Starting in 1963, coal companies received decommissioning premiums for reducing their production capacities, and in 1968, 25 coal mining companies merged into a single company called Ruhrkohle AG and renamed RAG AG (Sachverständigenrat 1988, 194). Purchase agreements were signed between RAG AG and the main coal consumers: the steel industry and the power and heating sector. Since 1964, prices of domestic hard coal surpassed international prices, making subsidies key to protect the domestic industry (Herpich et al. 2018, 9). In addition to subsidizing coal sales, Germany subsidized the coal industry with tax cuts, guarantees, loans, social support for employees, and exemptions from environmental and water taxes (Meyer, Küchle, and Hölzinger 2010).

Until the mid-1960s, the coal crisis did not affect unemployment rates in the Ruhr area. Germany's "economic miracle" during the postwar period allowed workers to transfer from the hard coal to the steel and metal sectors. Only when the steel sector faced an economic crisis in 1968 did the government of NRW enact the first regional development policy, the DPR (see Section 5.2).

5.1.2. Social support framework for miners

Since the end of World War II, and especially since the coal crisis, coal workers received different forms of support mainly from the national government, some of which are still in place. This social support framework can be divided into three categories: (1)

reactive ad hoc measures to deal with the coal crisis, (2) measures to improve the attractiveness of mining jobs, and (3) long-term adjustment measures (Storchmann 2005, 1486f).

Reactive ad hoc measures to deal with the coal crisis

After the coal crisis in 1958 and the steel crises in 1966 and 1973–1974, the national government, in some cases supported by the government of NRW, granted short-term support for coal workers and companies to alleviate income losses, including the following:

- Hardship compensation (1959, 1966–1969): Given that hard coal production was partially paused during the crisis and miners did not receive a salary, the national and NRW governments paid hardship compensation (Härtefallausgleich) to reduce miners' income losses.
- Immediate aid pension fund (1964–1968): The national government supported mining companies by subsidizing their mandatory contribution to the miners' pension funds.
- Severance payments (1966–1979): One-time payments for coal workers who lost their jobs due to mine closures or rationalization were granted by the national government (equivalent to €223 million in 2005) and the government of NRW (equivalent to €7 million in 2000).

Measures to improve the attractiveness of mining jobs

Miners received several benefits after the war to attract more workers to the industry and enable the reconstruction of Germany. The main benefits were the following (Storchmann 2005, 1488f):

- Miners care certificate (1948–present): The government of NRW provides support for miners who cannot work in the mines for health-related reasons. It has included allowances, assistance finding alternative occupations, and coal for residential heating.
- Health insurance (1949–1965): The national government contributed to the miners' health insurance payments.
- Unemployment insurance (1949–1974): Hard coal workers were exempted from the compulsory unemployment insurance payments until 1971 and partly exempted until 1974.
- Miners' housing (1950–1996): The national government provided allowances and loans to construct and modernize miners' housing.
- Miners' bonus (1956–2008): The national government provided tax-free payments on top of the miners' salary. When the law was passed in 1956, miners received €0.64 per shift. This increased to around €5 in the 2000s.
- Accident insurance (1962–1963, 1967–1968): The national government provided subsidies to cover miners' accident insurance.

Long-term adjustment measures

The long-term support provided by the national government, partly financed by the mining *Länder*, consisted of two measures:

- Adjustment allowances (1960–present): The national government provided benefits to aid miners that lost their jobs, including the following (Landesregierung NRW 1968, 19f):
    - Wage subsidy: two years of wage subsidies to laid-off workers, paid by the former employer and the national government.
    - Waiting allowance while unemployed: unemployment allowance granted to miners that did not receive a severance payment; paid by the national government and the former employer.
    - Transitional aid for older or performance-reduced unemployed workers: granted to workers until they reach the pension age.
    - Travel expenses: paid to reemployed and transferred workers.
    - Separation allowance: compensation for maintaining double households given a change in the job location.
    - Expenses for family visit trips.
    - Right of residence under the Miners' Housing Act: lifelong tenancy rights for some miners.
    - Rent subsidies: for dismissed and relocated workers.
    - Supply of reduced-price domestic fuel.
- Adjustment money (early retirement payment) (1971–present): The adjustment money is a continuation of the transitional aid among the adjustment allowances granted by the national government, which covers two-thirds of the total expenses. The rest is borne by the governments of NRW and Saarland. The adjustment money is available to workers over 50 (for underground coal miners) and 57 (for surface coal miners) and is granted for up to five years after unemployment. After that date, the workers receive regular pensions. Recipients can work but not for their former employer or any of its subsidiary companies. This support is tax free. A cap is used so total earnings do not exceed previous earnings (Ver.di 2020). The volume provided depends on the individual's pension and covers only a part of the previous salary (BMWi 2008). Additional grants have to be paid by the employer if the adjustment money is below 60% of the previous salary (BAG 2017). These grants are defined by the "social plan" of the worker (i.e., an agreement between employer and employees used to regulate economic disadvantages caused by business restructuring and govern the liabilities of the employers during the reduction of production). Coal companies request the adjustment money from the NEA and from National Office for Economic Affairs and Export Control, which also provides grants for health care. The workers bear 50% of the costs of health care, just as they would under regular employment.

5.2. DPR (1968–1971)

5.2.1. Overview

Between 1968 and 1971,[1] the government of NRW implemented the Development Program Ruhr (DPR; Entwicklungsprogramm Ruhr) to mitigate the economic and job impacts of the coal crisis and reduce economic dependence on hard coal in the Ruhr area. The government of NRW bundled existing and new measures to attract businesses outside the mining sector, mainly through investment support (Goch 2009, 146). The program's goals were to create regional economic growth, improve the transportation and education systems, and ameliorate the social security of workers, among other things.

The DPR's total funding from 1968 to 1971 was DM17 billion (€8.7 billion). Most of the program's funding came from NRW, with support from the national government. The European Community co-financed the social component of the DPR.

Studies on the effectiveness of the DPR have yielded mixed results. Some suggest that the program initiated change through improvements in the educational and infrastructure systems despite substantial portions of its funding being allocated to the coal and steel industries (Arndt et al. 2015, 101; Goch 2009, 147). Other studies have argued that the positive developments that took place in the Ruhr area during the early 1970s were part of the economic cycle rather than a result of the DPR (Röhl et al. 2018, 12; Sachverständigenrat 1988, 196). A barrier to the success of the DPR was the spatially intensive character of the coal and steel industries and the high levels of land contamination in the Ruhr area, which led to a shortage of land suitable for new economic activities. Moreover, some coal and steel companies were worried that new businesses could increase competition for qualified workers (Butzin 1993, 9). As a reaction, they refused to sell land despite its being underused, making it even more difficult to attract new companies (Sachverständigenrat 1988, 190). This phenomenon, which has been referred to as "ground lock," forced new companies to settle outside the Ruhr area and even outside of NRW.

5.2.2. Mechanisms and implementation

5.2.2.1. Administrative structure

The NRW government was responsible for implementing the DPR. The program was developed by a group of advisers in the *Länder* chancellery appointed by the prime minister of NRW (the equivalent of a governor), who worked together with *Länder* departments, the Employment Office, the Regional Association of the Ruhr area, and other authorities and agencies in the region. Since no administrative authority

1 The program was initially planned to last until 1973 but was replaced in 1971 by the North Rhein–Westphalia Program, which targeted not only the Ruhr area but the whole NRW region.

represented the whole area, the *Länder* chancellery coordinated the measures between departments.

The large number of measures implemented by the DPR required high levels of coordination and communication between national and local stakeholders. At that time, however, the Ruhr area was a loose association of different cities. Moreover, in line with Germany's federalism, certain measures, such as environmental initiatives, regional economic development, and urban planning, were the sole responsibility of the NRW government, and other measures, such as supraregional transport projects or labor market policy, were the responsibility of the national government (Kühn 1968). To address this coordination challenge, the chancellery of NRW operated as the main planning entity of the DPR, defining which projects were to be implemented by whom and organizing communication among actors.

A committee met every four weeks to approve loans and grants for industrial settlements. This committee consisted of representatives of multiple *Länder* and national agencies, including the national minister of economics and the NRW minister of economics. The committee enabled alignment between national and *Länder* development strategies. Once the committee approved loan and grant applications, funds were allocated by the Ruhr Coal District Settlement Association (the entity responsible for spatial planning in the Ruhr area) in cooperation with the municipal governments of Arnsberg, Münster, and Düsseldorf and the responsible NRW ministries.

5.2.2.2. Programs and qualified entities

The DPR had the following components, which are described in the following sections: (1) social safety net and unemployment benefits, (2) attraction of companies to promote industrial employment, (3) transportation and urban infrastructure, (4) educational institutions, (5) clean air and water, (6) recreation, (7) urban development, and (8) promotion of the Ruhr area.

Social safety net and unemployment benefits

The DPR social policy consisted of measures to mitigate the harm of job losses and provide retraining opportunities outside the mining sector. These measures complemented the support provided by the national government (see Section 5.1.2).

The government of NRW spent DM30 million (€15 million) to support miners who lost their job for a maximum of 24 months so that they could keep their standard of living. Workers who enrolled in retraining programs received a subsistence allowance, along with coverage for additional costs from the NEA. This agency received funds from the European Community, the national government, and NRW.

Attraction of companies to promote industrial employment

The DPR offered investment incentives to attract companies and support existing ones

in the Ruhr area. Investment incentives included the following (Landesregierung NRW 1968, 23 f):

- European Recovery Program (ERP) funds: loans with an interest rate of 6% over 12–20 years, which amounted to DM88 million (€45 million) in 1967 and 1968.
- NEA funds: loans with an interest rate of 4.25% and a term of 10 years, which amounted to DM115 million (€59 million).
- Coal and Steel Union funds: loans with an interest rate of 4.5% to 6.5% and a term of 13 years. These funds were approved by the European Commission. A credit volume of about DM120 million (€61 million) was planned.
- Funds from NRW: grants, interest subsidies, and job loans amounting to DM54 million (€28 million) for 1968.
- *Länder* guarantees: loan guarantees to the private sector of up to DM500 million (€256 million).
- Investment bonuses: 10% tax deductions (NRW absorbed 63% of the reduced tax revenue).

Given that "ground lock" (see Section 5.2.1) limited the availability of land for industrial and commercial purposes, the government of NRW acquired several real estate properties, allocating roughly DM90 million (€46 million) for this purpose.

Transportation and urban infrastructure

Before the coal crisis, urban centers in the Ruhr area developed around coal mines without enough connections to neighboring cities. This hindered workers' capacity to find jobs outside the mining industry (Bogumil et al. 2012, 15). In this context, the DPR developed regional transportation systems (Landesregierung NRW 1968, 27 f):

- Expanding the road network and local public transport systems: DM4.3 billion (€2.2 billion), of which DM2.5 billion (€1.3 billion) was financed by the national government and the rest by municipalities and NRW.
- Developing a regional railway system: DM1.6 billion (€800 million), of which DM700 million (€350 million) came from the national government and DM900 million (€450 million) from NRW.
- Developing urban and district centers, the public railway system, and other urban renewal projects: DM400 million (€205 million) spent by 1973.

Educational institutions

The lack of educational institutions in the Ruhr area was an important barrier to economic development. Until the mid-1960, the area had no universities, so the DPR developed educational and training facilities. Expanding secondary schools and universities was also intended to increase mobility by improving local skills and enabling people to find jobs outside the mining sector and the Ruhr area. The DPR prioritized higher education, with a specific focus on engineering schools and pedagogic colleges (Landesregierung NRW 1968, 53 f).

Clean air and water

One goal of the DPR was to mitigate air and water contamination caused by steel and coal production in the Ruhr area. The DPR allocated DM130 million (€66 million) for decommissioning industrial facilities. The water management measures targeted the two main rivers in the area. It allocated approximately DM140 million–DM150 million (€72 million–€77 million) for the Ems River, which hosted a large water treatment plant, including around DM90 million (€46 million) from municipal authorities and around DM50 million (€26 million) from NRW. For the Ruhr river, it allocated DM240 million (€123 million) to a variety of projects but ended up spending around DM400 million (€205 million) (Landesregierung NRW 1968, 57).

Recreation

The DPR financed the construction of five recreation centers situated between cities in the Ruhr area, at DM13 million (€6 million) each. These were 20–25 hectares (49–62 acres) in size and offered sports and swimming facilities and areas for recreation. In addition, a water reservoir, at DM89 million (€46 million), was split roughly evenly between NRW and its municipalities, and other recreational facilities were financed for approximately DM7.2 million (€3.7 million) (Landesregierung NRW 1968, 65).

Urban development

The DPR designated around DM24 million (€12 million) for recultivation of mining waste dumps and afforestation, DM132 million (€67 million) to decommission and environmentally remediate former industrial sites, and DM100 million (€51 million) to renovate buildings. Roughly 50% was spent as wages for unemployed individuals who worked on these projects (Landesregierung NRW 1968, 67 f).

Promotion of the Ruhr area

The DPR sought to improve the image and perception of the Ruhr area in the rest of the country via advertising campaigns and information dissemination. However, the program did not list any specific measures and had no budget associated with this component.

5.3. APR (1980–1984)

5.3.1. Overview

The Action Program Ruhr (APR; Aktionsprogramm Ruhr) took place from 1980 to 1984 and was a reaction from the government of NRW to the economic downturn resulting from the oil crisis of 1979. The APR combined existing and new assistance programs to promote economic reorientation. These programs sought to prevent emigration by promoting regional economic development. The main goals were to (1) reduce unemployment via improvements in the labor market and workforce development

policies; (3) diversify the regional economy; (4) promote innovation and forward-looking technologies; and (4) improve living conditions with new measures in urban development, ecology, culture, and leisure.

The APR continued the focus of the previous Technology Programs, which were designed to create high-skilled jobs via technology and innovation and facilitate technology transfer (Heinze et al. 1996, 30). However, a shift in emphasis in the APR led to more environmentally oriented measures aimed at improving the quality of life in the Ruhr area.

The employment and social measures of the APR were complemented by national measures, mainly financed via the NEA (Landesregierung NRW 1979). APR's total budget was DM6.9 billion (€3.5 billion), which consisted of spending from NRW and additional support from the national government and municipalities. Its costs also included estimated income losses for NRW due to tax cuts implemented by the program. NRW financed its share mostly via taxes and loans (77%).

Even though economic reorientation was intended, slightly less than a third of the total funding benefited the coal and steel industry. At the end of the 1980s, compared with the rest of Germany, the Ruhr area still showed lower GDP growth rates, higher rates of unemployment, and a population decrease. Therefore, the APR was evaluated as unsuccessful (Sachverständigenrat 1988, 196). Moreover, the APR solidified regional dependence on a few large companies. As innovation funds focused on existing industries, the APR reinforced a lack of diversification in a highly specialized and technology-oriented environment. High levels of qualification in traditional economic activities and training institutions did not help the region to adapt to the changes required by the declining importance of coal (Mikat et al. 1989, 278). Moreover, according to assessments made by the national government, the APR and previous programs implemented in the Ruhr area contributed considerably to the country's indebtedness and budget deficit (Sachverständigenrat 1988, 196).

5.3.2. Mechanisms and implementation

5.3.2.1. Administrative structure

As was the case with previous programs implemented in the Ruhr area (DPR and Technology Programs), the APR was administrated by the government of NRW. However, the APR included a more participative approach. The government organized and hosted a two-day conference in which representatives of regional organizations, agencies, bureaus, members of the parliament (of NRW and Germany), employees, universities, and churches met to discuss the main challenges facing the Ruhr area and possible solutions. These discussions were used in the design of the APR.

5.3.2.2. Programs and qualified entities

The APR had seven main components, described in the following sections, that aimed to (1) tackle unemployment and improve education (DM583 million; €298 million); (2) develop technologies and innovations (DM710 million; €363 million); (3) foster urban renewal, improved living conditions, and sports (DM1,676 million; €856 million); (4) provide environmental protection for a modern industrial area (DM1,349 million; €690 million); (5) preserve the Ruhr area's role as a key provider of energy (DM1.6 billion; €818 million); (6) strengthen the region's investment capacity (DM871 million; €445 million); and (7) improve the cultural life in the Ruhr area (DM68 million; €35 million) (Heinze et al. 1996, 31).

Tackle unemployment and improve education

The measures tackling unemployment in the APR complemented existing national measures (see Sections 3.1 and 5.1.2) and the national labor market program for regions with employment programs, through the following initiatives:

- Labor procurement measures: The government of NRW implemented a supplementary program to the ABMs (initiated on the national level, see Box 5) to extend its duration from 24 to 36 months. NRW allocated DM243 million (€124 million) for this program. The national government financed the wage costs during the first two years of implementation, and NRW financed the third year. Additionally, NRW devoted DM2.5 million (€1.3 million) to create temporary ABM jobs in combination with training opportunities. Again, the first two years were financed by the national government via the NEA and the third year by NRW.
- Information and training center for disadvantaged unemployed individuals: NRW contributed DM14 million (€7 million) to develop and operate information centers in charge of qualification and training activities in business and technical matters, especially for disadvantaged groups, such as long-term and recurrent unemployed, older, and disabled people.
- Education programs: Another pillar of the APR for addressing unemployment was the improvement of the education system (Landesregierung NRW 1979, 19f). NRW, its municipalities, and the NEA financed expanding middle schools (*Hauptschule*[2]) and school counseling centers and establishing centers to provide vocational and educational advice, along with other educational institutions. Increasing the offer of higher education delayed the labor market entry of the large segment of the population associated with high birth rates after World War II, flattening the peak of people looking for jobs. It also opened job options for workers, as they were able to qualify for a larger variety of jobs.

2 In Germany, the school system after primary school (grades 1–4) is divided into Hauptschule (grades 5–9), Realschule (grades 5–11), and Gymnasium (grades 5–12). Regional differences exist in the length of primary and further education. The grade at the end of primary school usually determines which type of school the pupils will attend afterward.

Box 5. Subordinate National Labor Market Program for Regions with Employment Problems

The national labor market program for regions with employment problems had three main goals: (1) contributing to the preventive retraining of qualified workers, (2) helping long-term or unskilled unemployed people to find a permanent job, and (3) promoting the Labor Procurement Measures (ABMs) to improve social services (counseling and care services) and social infrastructure (environmental protection and improvements in the living environment) (Landesregierung NRW 1979, 16 f). The ABMs created low-skilled, low-paid jobs financed by the NEA. The benefits were provided to public and nonprofit organizations (mainly via grants or loans) to employ workers for several days to up to 24 months (Oschmiansky 2020a). In the Ruhr area, these organizations were mainly in charge of social services and social infrastructure. The employer was required to pay wages, taxes, and social insurance contributions. The workers received an allowance of at least 60% of the salary that they would have earned from regular employment. The aim was to enable a transition into regular employment. The ABMs were only used when other training and transition efforts failed and were highly controversial:

- Workers did not receive sufficient resources to make a decent living and needed additional state aid.
- The ABMs had a negative impact on the labor market because they gave participating employers an advantage over those that did not have ABM-supported workers.
- ABM-supported workers were often socially stigmatized.
- As recipients did not count as unemployed, the ABMs were often criticized for improving employment statistics.

In 2012, the ABM program was discontinued (Oschmiansky 2020a).

Future-oriented technologies

A portion of APR funding (approx. DM750 million; €383 million) was allocated to R&D activities and technology transfer to diffuse research findings and innovations, especially among SMEs. The aim was to reorient the economy and create new jobs. However, a large share of the funding went to the iron and steel industries, slowing the economic reorientation. Funding was used for the following (Landesregierung NRW 1979, 25f):

- Researching innovation and technology in the iron and steel industries.
- Establishing a research center to produce nonconventional crude oil (e.g., tar sands).
- Promoting innovation and technology transfer centers in universities.
- Creating the National Center for the Humanization of Working Life to promote safer working conditions.
- Developing research institutes and projects in various other domains, such as microelectronics and measurement electronics.

Urban renewal

To address the barrier caused by the lack of enough clean land for new enterprises (see Section 5.2.1), the APR created the Ruhr Property Fund (Gründstücksfonds Ruhr),

which NRW funded with DM500 million (€256 million) (Landesregierung NRW 1979, 33f) to acquire and rehabilitate contaminated industrial sites. In the 1980s, 82.5% of the budget was used for land purchases and 17.5% for land treatment (Mikat et al. 1989, 378). Additionally, the LDA was established to manage the fund and oversee land acquisitions. Municipalities were able to propose sites to acquire and rehabilitate and decide whether these would be sold to the private sector (generating income for the Ruhr Property Fund) or used in their own projects (Mikat et al. 1989, 378). The ministers for urban development and finance assessed the budget available to rehabilitate sites and potential follow-up costs of public use (Ministerium für Inneres NRW 1984), and the LDA oversaw the rehabilitation projects. The LDA and the Ruhr Property Fund still operate today and receive funding from the European Union, the national government, the NRW government, and municipalities (Heyer n.d.).

The NRW government designated an additional DM200 million (€102 million) to modernize 10,000 residential units and DM360 million (€184 million) to modernize and expand 6,600 apartments. Additional measures included constructing public parks, relocating companies, and converting old buildings into living spaces.

Environmental protection

The APR implemented a set of environmental programs, including (1) a tax exemption on investments that create environmental protection, (2) support for the decommissioning and restoration of heavily polluting facilities, and (3) nature and water preservation measures (Landesregierung NRW 1979, 41f).

The tax exception applied to both personal and corporate income taxes. The burden of the forgone personal income tax fell on the national government (43%), the NRW government (43%), and municipalities (14%). The burden of the forgone corporate income tax was shared equally between the national government and NRW.[3] The national and NRW governments each estimated forgone tax revenue of DM250 million (€128 million) due to this program.

Decommissioning and restoration measures were financed jointly by the national government and NRW. The national government spent DM120 million (€61 million) on air pollution control in old industrial facilities, and NRW contributed DM585 million (€299 million) for environmental protection measures for steelworks and power plants. An additional DM70 million (€36 million) was allocated by NRW for safeguarding nature and the water balance.

Preserve the Ruhr area's role as a key provider of energy

The APR, which complemented the "coal priority policy" (a set of national and *Länder* measures to protect coal production in Germany through different forms of subsidies) (Storchmann 2005), aimed to preserve the Ruhr area's role in energy production

3 In Germany, income and corporate income tax are both considered "joint taxes," which are shared among the national, Länder, and municipal levels. The burden sharing described in the paragraph mirrors the share of the taxes for the respective political levels.

through the following initiatives:

- A power plant rehabilitation program: DM660 million (€337 million) from 1980 to 1985, financed by NRW.
- Construction of the Voerde coal-fired power plant: DM320 million (€163 million) in loan guarantees from NRW.
- Deployment of district heating: DM300 million (€153 million), which included grants and loans between 1965 and 1978.
- Support to expand the "Technology Programs": DM289.9 million (€148 million) from NRW (Landesregierung NRW 1979, 49f) for this program, which sought to increase the efficiency of hard coal production and refinement.

Enhancing the investment capacity

Another APR goal was to increase the investment capacity of the Ruhr area. Under the assumption that this capacity depended not only on the regional economy but also on municipalities' financial resources, NRW extended the investment lump sum for municipalities from DM200 million to DM300 million (€100 million to €153 million). Two-thirds of this amount was distributed equally among all the municipalities of the Ruhr area, and one-third was reserved for municipalities with higher unemployment rates (most of the Ruhr area) (Landesregierung NRW 1979, 53f). The national government contributed additional investment support (via the GRW program; see Section 5.7.1), covering 5%–20% of the costs for the creation and expansion of businesses. The government allocated different amounts to different cities and districts to direct growth to target areas. In total, the national government contributed DM330 million (€169 million) to expand the investment capacity of cities in the Ruhr area while the APR was in effect.

Cultural life in the Ruhr area

The APR supported performing arts projects with DM12 million (€6 million) from NRW, funded cultural education with approximately DM5 million (€2.5 million) from national sources and municipalities, and supported museums, art exhibitions, and maintenance of historical monuments with DM5 million (€2.5 million) from NRW and DM3.3 million (€1.7 million) from municipalities (Landesregierung NRW 1979, 60f).

5.4. FICSR and FIRNRW (1987–1991)

5.4.1. Overview

In 1987, the Future Initiative for Coal and Steel Regions (FICSR; Zukunftsinitiative Montanregionen) was implemented to address a massive wave of layoffs in the steel and coal industry (Mikat et al. 1989, 9). The objectives did not differ much from the previous programs (DPR and APR). The FICSR focused on (1) infrastructure, (2) the labor market, (3) educational and vocational training, (4) attractiveness of the region,

(5) attracting companies, and (6) future technologies. A further goal was to bring existing programs under one roof to develop a coherent approach for the Ruhr area.

The program spent DM520 million (€266 million) per year from 1987 to 1991, including DM293.7 million (€150 million) from NRW, DM160 million (€82 million) from GRW (see Section 5.7.1), and DM66.6 million (€34 million) from the European Community under the RESIDER program (Sachverständigenrat 1988, 196).

In 1989, the FICSR was expanded to the remaining regions and renamed Future Initiative for the Regions of North Rhine–Westphalia (FIRNRW; Zukunftsinitiative für die Regionen Nordrhein-Westfalens). It was implemented in 15 NRW regions and differentiated by chambers of industry and commerce (Arndt et al. 2015, 106f). As with the FICSR, the FIRNRW coordinated existing funding drawn from various sources, including the GRW (see Section 2.1.1.1), the complementary NRW regional economic development programs, European Structural and Investment Funds, the National Structural Assistance Act, various technology programs, and programs to promote training and further education (Heinze et al. 1996, 38f).

A novel aspect of the FICSR was the Coal and Steel Regions Commission (Kommission Montanregionen), a group of experts in charge of overseeing the implementation of the program; some participatory and consensually based mechanisms were used to increase public acceptance. Residents of the Ruhr area viewed this new approach positively, primarily because of the knock-on effects it generated in terms of collaboration of regional stakeholders. However, in some cases, the commission failed to consult relevant stakeholders and was criticized for not being sufficiently transparent in allocating funding (Arndt et al. 2015, 106f). Compared with previous programs, the FICSR also stood out for focusing on economic renewal instead of on the coal and steel sectors and transferring responsibility to subordinate political levels (Sachverständigenrat 1988, 197).

5.4.2. Mechanisms and implementation

5.4.2.1. Administrative structure

Structure of the Commission

Members of the Coal and Steel Regions Commission were appointed by the prime minister of NRW. The commission's chair was a professor of law, and its members included representatives of unions, banks, the Chamber of Industry and Commerce, and industrial organizations. The commission was supported with an office and a secretariat for the chair in the Ministry of Economics, SMEs, and Technology (Mikat et al. 1989, 10).

Structure of FICSR and FIRNRW

To receive funding via these programs, districts within NRW had to display (1) a

high proportion of employees in the steel and coal sector and (2) a high level of unemployment. Eight districts were selected to participate in the FICSR and 15 in the FIRNRW. Each district was required to formulate regional development plans through regional conferences, in which representatives of local governments, universities and research institutions, trade unions, and other local organizations exchanged views on local development potentials (Heinze et al. 1996, 38). The government of NRW was in charge of the final selection of projects, which was based on their relevance in terms of economic development and environmental improvement in the Ruhr area (Arndt et al. 2015, 106f; Goch 2009, 160).

5.4.2.2. Programs and qualified entities

The task of the Coal and Steel Regions Commission was to develop policy proposals based on a detailed analysis of the regions within the Ruhr area (and later the whole NRW). The commission relied on a multistage procedure:

1. Representatives of the regions received questionnaires related to the priorities of the FICSR. These priorities were previously defined by the commission according to problems brought forward by the NRW parliament and residents.
2. Members of the commission met in regional conferences and individually with partners in the regions, including mayors, county councils, chambers of industry and commerce, the German Federation of Trade Unions, employment offices, universities, and other industry representatives. The purpose was to assess the main challenges facing the region and develop a local network of partners.
3. The commission received input from different experts via written comments, private consultation, and open discussions.
4. The commission developed a final report, which included further information from several studies by research institutes and statistical data.

5.5. IBAEP (1989–1999)

5.5.1. Overview

International Architecture Exhibition (Internationale Bauausstellung; IBA) is a common instrument used in Germany for urban development based on the installation of architectural projects in specific regions or cities. The IBA Emscher Park (IBAEP) promoted economic, urban, and environmental renewal in the Ruhr area for 10 years (1989–1999). The aim was to improve the attractiveness of the Ruhr area. According to assessments made by the German parliament, at the end of the 1980s, cities in the Ruhr area had the worst image among all major German cities and fell far behind the neighboring cities of Düsseldorf and Cologne in terms of attractiveness as a place to live and work (Sachverständigenrat 1988, 191). The IBAEP sought to enhance the Emsian region (the industrial center of the Ruhr area) through new urban projects. It brought together stakeholders from business, politics, and professional associations to engage in dialogue to change the Ruhr area's image as a declining, deindustrialized

region (MSWV 1988, 5).

Even more so than the FICSR (see Section 5.4), the IBAEP encouraged a high degree of stakeholder participation by implementing a new planning process and enabling stakeholders to develop their own projects. The IBAEP was the first initiative managed by a private planning company: IBA Emscher Park, which operated as a GmbH (limited liability company) but was entirely owned by NRW. The company established guidelines, selected projects, and monitored their implementation.

Funding for the IBAEP came from the private sector and existing programs; no new support programs were implemented. From the public sector (NRW, the national government, and the European Union), 36 funding programs supported the IBAEP. These programs covered urban renewal and development, economic development, housing construction, subsidies for training measures, and nature conservation (Reicher et al. 2011, 45). Between 1989 and 1999, around 120 projects were carried out (DM5 billion; €2.6 billion). One-third of this support came from the private sector and two-thirds from the public budget (Goch 2009, 162). Not all projects were completed by the end of the IBAEP. Uncompleted projects were continued in follow-up programs.

Completed projects, especially large investments, successfully contributed to improving the perception of the Ruhr area both internally and nationally (Reicher et al. 2011, 12; Goch 2009, 163; Danielzyk 1992, 94). However, the goal of changing the local planning culture was less successfully achieved, given that measures were inconsistently applied and the new approach was unable to replace some existing planning processes.

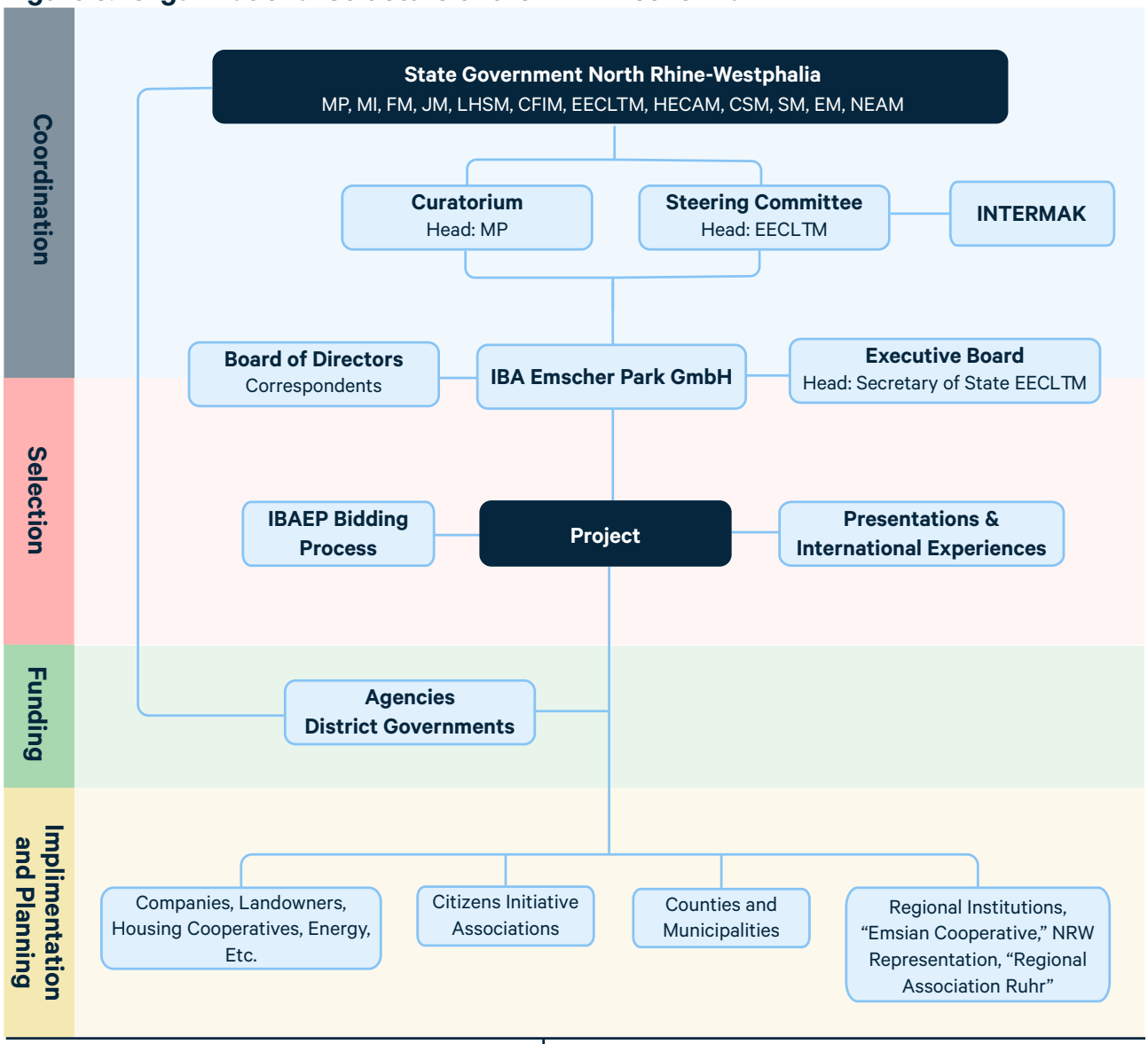
5.5.2. Mechanisms and implementation

5.5.2.1. Administrative structure

The IBAEP was created by the NRW minister for urban development. The management of the program was transferred to IBAEP GmbH, which employed 30 people (Jasper 2011, 43). The responsibility for implementing the projects was distributed among municipalities and private companies. Seventeen municipalities in the Ruhr area implemented projects. Initially, the board of directors of IBAEP GmbH consisted of five university professors; it was later expanded to 18 members from various fields (see Figure 5).

A steering committee, led by the NRW minister for urban development and including representatives from other ministries, municipalities, unions, and NGOs, was convened to select projects. The INTERMAK (Interministerial Working Group) examined whether projects could be funded via existing programs. To be eligible, projects had to be innovative and future oriented and had to meet strict environmental standards. The IBAEP held competitive tenders that were open to national and international bidders. The idea was to draw international attention to the Ruhr area and advertise a positive postindustrial transition in the region. However, the IBAEP also encouraged the participation of local stakeholders.

Figure 5. Organizational Structure of the IBA Emscher Park



MP	Senator (Ministerpräsident NRW)
MI	Ministry of Interior NRW
FM	Ministry of Finances NRW
SM	Ministry for Schools NRW
EM	Ministry of Environment NRW
JM	Ministry of Justice NRW
CSM	Ministry of Culture and Science NRW
CFIM	Ministry for Children, Family, & Integration NRW
NEAM	Ministry for National and European Afairs NRW
LHSM	Ministry of Labor, Heath & Social NRW
HECAM	Ministry of Health, Emancipation Care and Age NRW
EECLTM	Ministry of Economy, Energy, Construction, Living and Transportation NRW

Source: Authors' depiction based on Jasper (2011, 44).

5.5.2.2. Programs and qualified entities

The NRW Ministry for Urban Development identified six priority areas for the IBAEP, which are described in the following sections: (1) habitat restoration in the Ems river system, (2) landscape renewal, (3) preservation of industrial monuments as cultural sites, (4) construction of industrial and commercial parks, (5) promotion of new forms of housing, and (6) development of social, cultural, and sports facilities (Danielzyk 1992, 92).

Habitat restoration in the Ems river system

The most extensive project of the IBAEP was the restoration of the Ems river system over a length of 350 km (217 miles). The project exceeded its original estimated cost of DM8 billion (€4 billion), reaching DM10.6 billion (€5.4 billion) (EGLV 2021; Danielzyk 1992, 93). The Ems river previously served as a wastewater system for the coal and steel industries. As part of the restoration of the river system, an underground sewage system with decentralized treatment plants was installed, water was filtered, and the river was returned to its original path wherever possible. The whole project outlasted the duration of the IBAEP and is expected to be completed in 2021.

Landscape renewal

The construction of the Emscher Landscape Park was another core component of the IBAEP. The project included 200 measures, ranging from the redevelopment of fallow land to the creation of small biotopes. In the process, large wastelands and industrial sites were converted into recreation areas. Some contaminated areas were deemed too costly to restore and were left to be reclaimed by nature (Reicher et al. 2011, 46).

Preservation of industrial memorials as cultural sites

The IBAEP sought to preserve old industrial facilities, including the UNESCO heritage site Zeche Zollverein, a former coal mine in Essen, and a steel mill in Duisburg. This project was made possible by the Land Development Agency with funding from the Ruhr Property Funds (Grundstückfond Ruhr), which was established under the APR (see Section 5.3.2.2). In addition, in 1995, the NRW government and RAG AG (the last hard coal producer in Germany) created a foundation for industrial and monumental preservation, the Industrial Landmark Foundation NRW (Industriedenkmal-Stiftung NRW), which converted existing industrial facilities into museums, monuments, and other cultural sites.

Creation of commercial industrial parks

In 19 former industrial sites in the Ruhr area, the IBAEP constructed commercial, industrial, and science parks, consisting of office and industrial buildings surrounded by public parks. These parks had to meet strict environmental standards and feature attractive architecture. The projects, united by the motto “Working in the Park,” attracted broad external attention but had minimal impacts on employment in the Ruhr area (Goch 2009, 163).

Promotion of new housing

The IBAEP also financed constructing 2,500 new apartments (75% of which were publicly subsidized) and renovating 3,000 buildings. The projects considered the needs of single parents (especially women), disabled people, elderly people, and children. A housing subsidy program for low-income families was implemented (Reicher et al. 2008).

Development of social, cultural, and sport facilities

Among the projects for strengthening the attractiveness of the Ruhr area was the foundation of the Kultur Ruhr GmbH, which is the sponsor of the Ruhr Triennale, an international art festival that takes place in old industrial sites in the area (Reicher et al. 2008, 7). Based on the IBAEP master plan for tourism, the Ruhr-Touristik GmbH was founded (Reicher et al. 2008, 7). This company is responsible for organizing tourist visits to the Ruhr area. Additionally, various museums, sports centers, and health centers were created.

5.6. AFTSC (2007 – ongoing)

5.6.1. Overview

Between 1950 and 2008, the national government provided €289 billion of direct subsidies and a total of €331 billion of direct and indirect subsidies to the hard coal industry (Meyer, Küchle, and Hölzinger 2010). Subsidies steadily increased and in 2005 reached a value of €75,000 per employee in the mining sector, which was above the average annual salary in this industry (Frigelj 2009, 230). In 2007, the government passed a law, the Act on Financing the Termination of Subsidized Coal Mining (AFTSC; Gesetz zur Finanzierung der Beendigung des subventionierten Kohlebergbaus), to gradually end sale subsidies for domestic hard coal by 2018. Production had already declined from 150 million metric tons in 1957 to 21 million in 2007 and the number of employees from more than 600,000 to 33,000. However, even after this decline, 5%–10% of the employed people in the Ruhr area still worked in the mining sector, making the decision over whether to end subsidies a contentious one.

Various organizations argued that ending the subsidies by 2012 could have saved €4 billion to €10 billion in the form of fewer environmental damages and subsidies, which could have been used to retrain workers and create decommissioning jobs (Frigelj 2009, 230). Instead, unions, workers, hard coal producers, and politicians (mainly social democrats) were successful in moving the phaseout date to 2018. In their view, this strategy would give workers enough time to retire, thus reducing the costs of compensation for early retirement.

The AFTSC updated regulations on the adjustment allowances for laid-off workers and was accompanied by measures from the national government for the reemployment of workers who did not meet the age criterion. In addition, the RAG Foundation (RAG-

Stiftung) was created to ensure that the costs of postmining perpetual obligations (mainly related to water management) were financed.

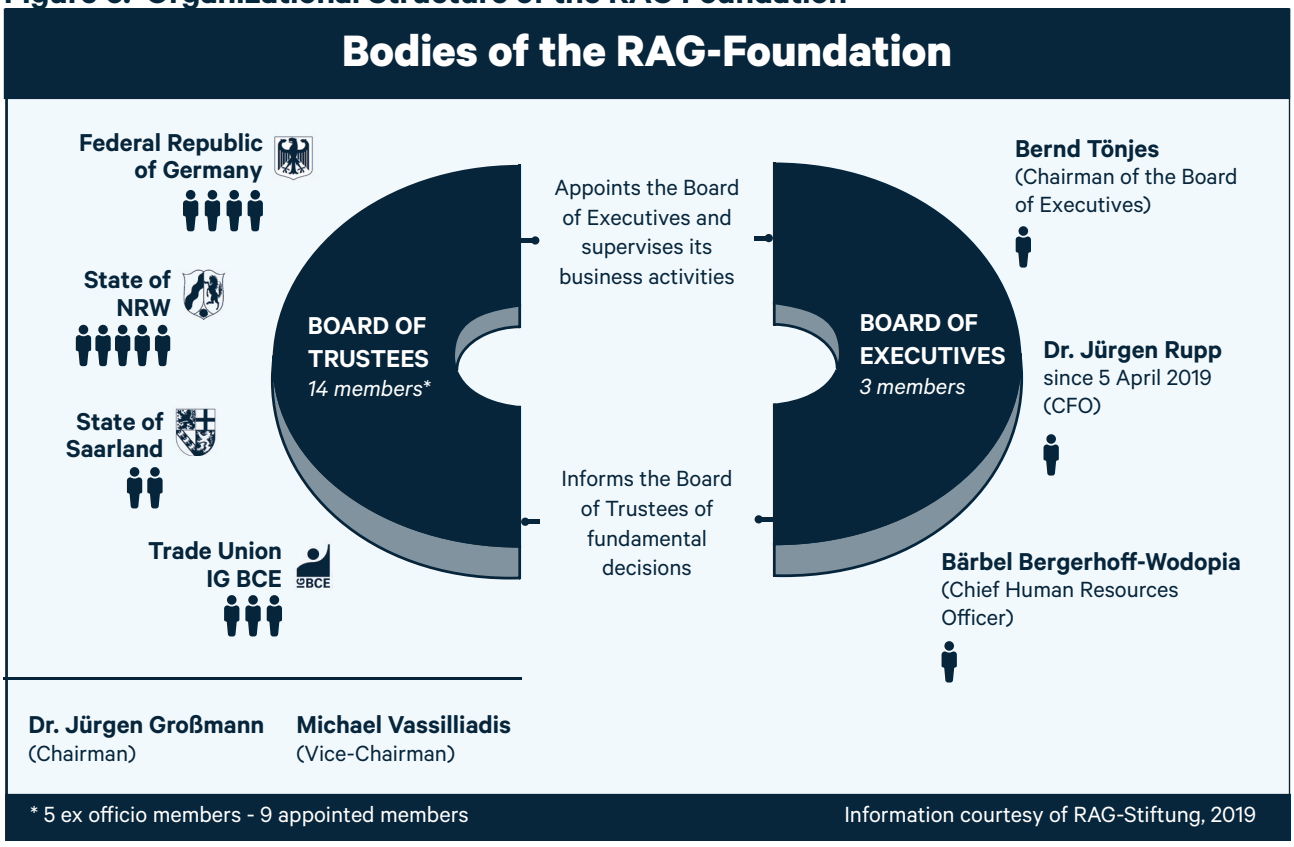
5.6.2. Mechanisms and implementation

5.6.2.1. Administrative structure

The AFTSC was passed on the national level. The National Ministry for Economic Affairs and Energy established guidelines to provide further specifications on implementing this policy. The ministry's subordinate office, the National Office for Economic Affairs and Export Control, was in charge of disbursing the subsidies for domestic hard coal, set to phase out by 2018, and funds allocated for decommissioning coal infrastructure and adjustment allowances.

The AFTSC established the RAG Foundation to finance mining-related environmental remediation and contribute to a socially equitable transition (see Figure 6). The AFTSC established a board of trustees consisting of—among others—the ministers of NRW and Saarland, the national minister of finance, the national ministers for economic affairs and energy, and the chair of the IGBCE union.

Figure 6. Organizational Structure of the RAG Foundation



Source: RAG-Stiftung (2019a, 3).

5.6.2.2. Programs and qualified entities

The AFTSC has three main components, described in the following sections: (1) ending hard coal production by 2018 and financing the decommissioning process, (2) financing postmining environmental obligations, and (3) enabling a socially equitable adjustment process for workers.

Ending hard coal production and financing the decommissioning process

The AFTSC defined the yearly reduction of subsidies for the hard coal mining sector (see Table 10) from around €1.7 billion in 2009 to €940 million in 2018 (the final year of hard coal production).

The funds for 2019–2020 are only for decommissioning, as production ended in 2018.

Table 10. Subsidies for Hard Coal Production, 2009–2020

Year	Subsidies stated in the law (million €)	Actual subsidies (million €)	Hard coal production (1,000 metric tons)	Miners
2009	1,699	1,375.3	13,766	27,317
2010	1,550	1,319.4	12,900	24,207
2011	1,512	1,348.6	12,059	20,925
2012	1,363	1,181.8	10,770	17,613
2013	1,371	1,082.4	7,566	14,549
2014	1,284.8	1,168.7	7,640	12,104
2015	1,332	1,088.3	6,223	9,640
2016	1,053.6	1,278.5	3,849	7,480
2017	1,020.3	1,049.7	3,669	5,711
2018	939.5	967.3	2,584	4,125
2019	794.4[a]	939.5[b]	–	–
2020	1,658.4	1,932.2[b]	–	–

[a] Payments are distributed in the period 2019–2021.
[b] Contains additional payments for decommissioning of coal production infrastructure.
Sources: (Bundesministerium der Finanzen 2019; Statistik der Kohlenwirtschaft e.V. 2019c; 2019d; Wissenschaftliche Dienste 2010).

Postmining environmental obligations

The main postmining obligation for coal companies stipulated in the AFTSC is water management (surface and subsurface). As Figure 7 shows, the key aspects of this obligation are pit water management, polder measures, and groundwater purification.

As these activities will be needed for an unforeseeable amount of time, they are

defined as "perpetual obligations" in the contract between the RAG Foundation and the mining *Länder* (RAG-Stiftung et al. 2007). The responsibility for decommissioning costs was split among the national government, the governments of NRW and Saarland, and the RAG Foundation. The RAG Foundation's initial capital consisted of €2 million from RAG AG (the last hard coal producer in Germany) and profits from the chemical company Evonik AG, whose property was transferred to the RAG Foundation. In addition, some shares of Evonik AG were sold to increase this initial capital. In 2019, the foundation's assets were around €18.7 billion in 2019, and its expenses were approximately €291 million (see Figure 7); the foundation declared €414 million in profits for that year (RAG-Stiftung 2019b, 2f).

While the RAG Foundation generates sufficient resources to cover the perpetual obligations, questions remain about its adequacy for a complete cleanup over the long term. For example, no independent assessment of the degree of environmental damage created by years of coal mining in the Ruhr area was carried out, and only internal data from RAG AG were used. Furthermore, if Evonik AG runs into financial difficulties, the national government, NRW, and Saarland would need to bear up to one-third of the costs associated with these obligations.

Adjustment money (early retirement)

With the implementation of the AFTSC, existing social support for the miners was restructured (see Section 5.1.2): adjustment allowances were discontinued, and social support was reduced to the adjustment money. Table 11 gives an overview of the volume of adjustment money in previous years.

Table 11. Adjustment Money, 2017–2020

Year	Total adjustment money (million €)
2017	100.1
2018	90.4
2019	95.8
2020	87.6

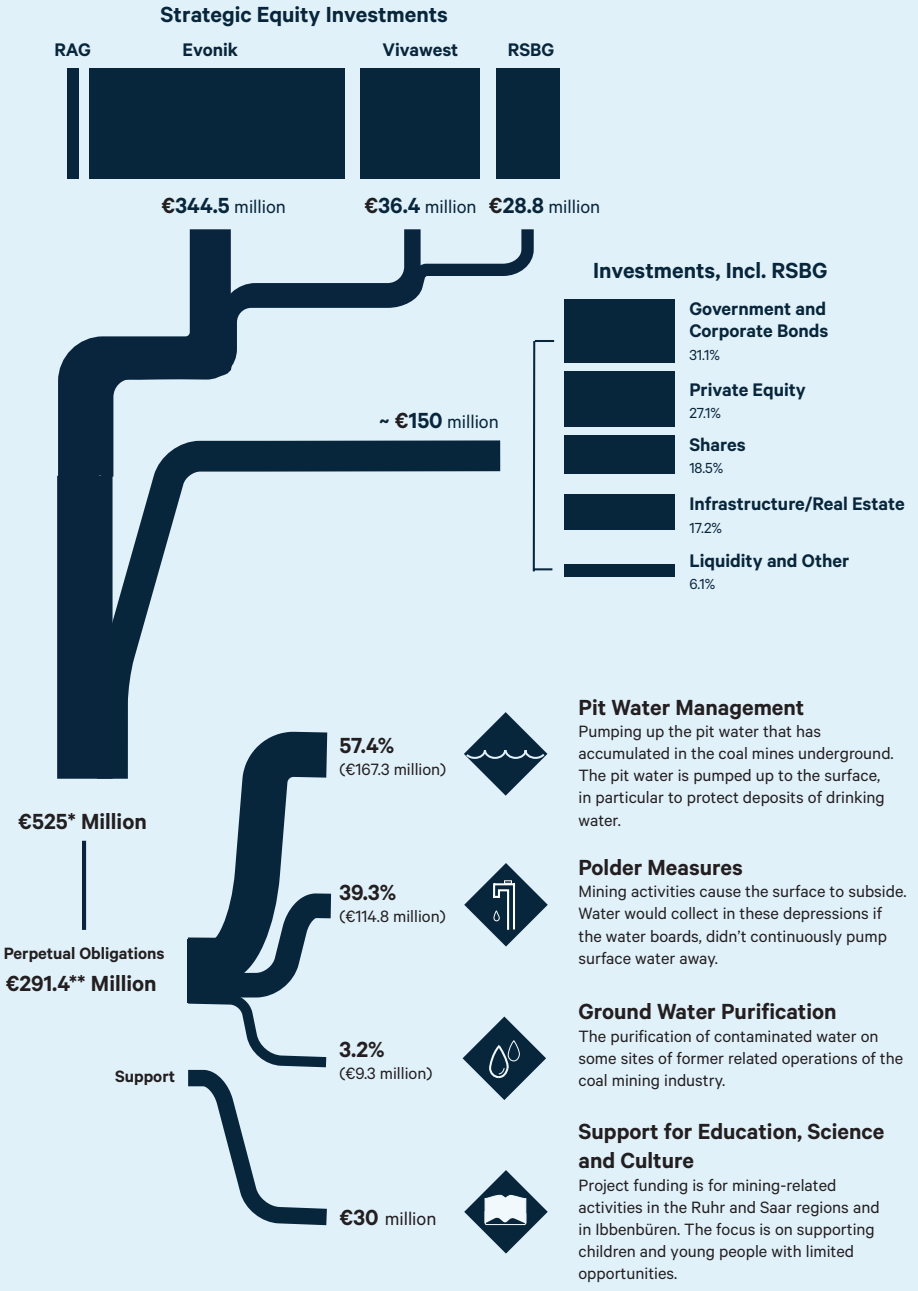
Source: BMF (2019).

5.7. Regional development policy framework

Since 2020, more than 20 regional development programs from six different national ministries (economy, interior, agriculture, family, education and research, and transportation and infrastructure) have been implemented to support economically struggling regions, including coal regions. The national government coordinates these programs, but they remain under the control of the *Länder* governments. The following sections give a brief overview of existing programs, with a focus on those relevant for coal regions.

Figure 7. The RAG-Foundation at a Glance

The RAG-Foundation bears the responsibility for financing the perpetual obligations resulting from hard coal mining in Germany. To fulfil this responsibility, it continually builds up its assets. In addition, the RAG-Foundation supports projects in the areas of education, science, and culture in the former mining regions along the Ruhr and Saar Rivers and in Ibbenbüren.



* In 2019, the RAG foundation generated nearly 525 million euros from dividends, distribution of profits, and interest income.

** In 2019, gradually decreasing. Plus the interest element for investments that RAG AG made in past years for the RAG-Foundation.

Source: RAG-Stiftung (2019a, 2-3).

5.7.1. Business promotion: The GRW

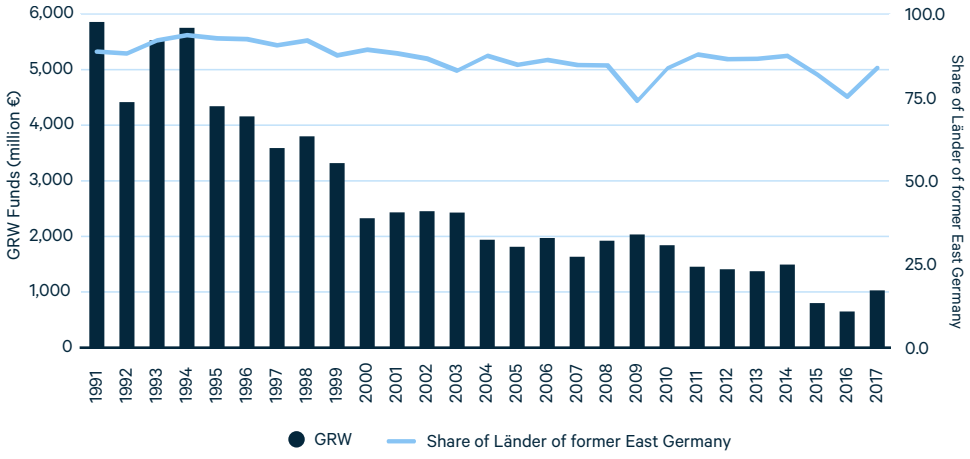
5.7.1.1. Overview

The Joint National/*Länder* Task for the Improvement of Regional Economic Structures (Bund-*Länder*-Gemeinschaftsaufgabe Verbesserung der regionalen Wirtschaftsstruktur; GRW) established in 1969, is the main public instrument in Germany for regional economic development. This policy supports economically weak regions, compensates for locational disadvantages, and provides incentives to create growth and employment (BMWi 2020d). The GRW promotes the adaptability and competitiveness of regions affected by structural economic change. It is meant to incentivize regions to take action themselves instead of passively receiving external intervention.

Over the years, the GRW has financed several programs for coal and steel regions. In 1980, for example, the GRW financed parts of the APR (see Section 5.3). Until 1986, the Ruhr area received DM5.8 billion (€3 billion) from the GRW to stimulate businesses and create business-related infrastructure. In 1988, the Coal and Steel Regions (Montanregionen) program of the GRW provided DM1 billion (Sachverständigenrat 1988, 195).

The GRW is funded equally by the national and 16 *Länder* governments. The national share is partly financed with EU funds. From 1991 to 2017, the GRW received around €72 billion (BMWi 2020d). Two-thirds was spent in the commercial sector, with the remainder on municipal investments in business-related infrastructure. The annual average volume between 1991 and 1993 was more than €5 billion. However, annual funding has declined (see Figure 8). In 2020, the national and *Länder* governments contributed €600 million each to the GRW (€1.2 billion annually) (BMWi 2020d).

Figure 8. Approved GRW Funds per Year and Share of the Funds Spent in Former East German *Länder*, 1991–2017



Source: IWH (2020, 10).

For 2009–2016, an evaluation study shows that the GRW had a clear positive effect on employment in the subsidized companies and moderately increased the regional GDP (IWH 2020). This study also found a slightly positive effect on the growth of median wages starting from the fourth year after completion of the projects and a robust positive effect on employment in the regions. However, GRW funding did not seem to improve the share of highly qualified employees in the companies that received support.

5.7.1.2. Mechanisms and implementation

Coordination among the different programs of the GRW is the responsibility of the Coordination Committee, chaired by the national minister for economic affairs and energy and formed by the national minister of finance and the ministers or senators[4] of economics of the 16 *Länder*. In the Coordination Committee, representatives of the national government have as many votes as the 16 *Länder*. Decisions can only be made by a quorum of three-quarters (Untiedt et al. 2016, 87). The national and *Länder* governments jointly define the rules for funding to ensure fair competition between different locations. The responsibilities of the Coordination Committee include defining areas for assistance, eligibility, conditions for assistance, type and magnitude of the assistance, distribution and allocation of funds, and subsequent monitoring and evaluation processes. The funding areas of the GRW are defined based on a uniform and transparent nationwide procedure in functionally delimited labor market regions. Implementing the GRW is the sole responsibility of the *Länder*, which decide which projects are supported and how much support is granted. They also issue approval notices and monitor compliance with the funding regulations by recipients.

5.7.1.3. Funding types

The funding priorities of the GRW include the promotion of SMEs, technological development and innovation, and support of rural areas. The GRW provides funding for commercial investments, investments in municipal business-related infrastructure, and noninvestment activities such as business network formation. Funding is available in three forms:

1. Grants: The grants are geared to the structural weakness or need of the respective region within the legal requirements for state aid. In C-assisted areas (see Figure 9 below), investment projects of companies of all sizes are subsidized with 10%–30% of the investment volume, depending on their size. In D-assisted areas, only 10%–20% of the investment volume is subsidized. Large companies[5] no longer receive support.

4 In Germany, 3 of the 16 Länder are city-states (Berlin, Hamburg, and Bremen). Their ministers are called senators.

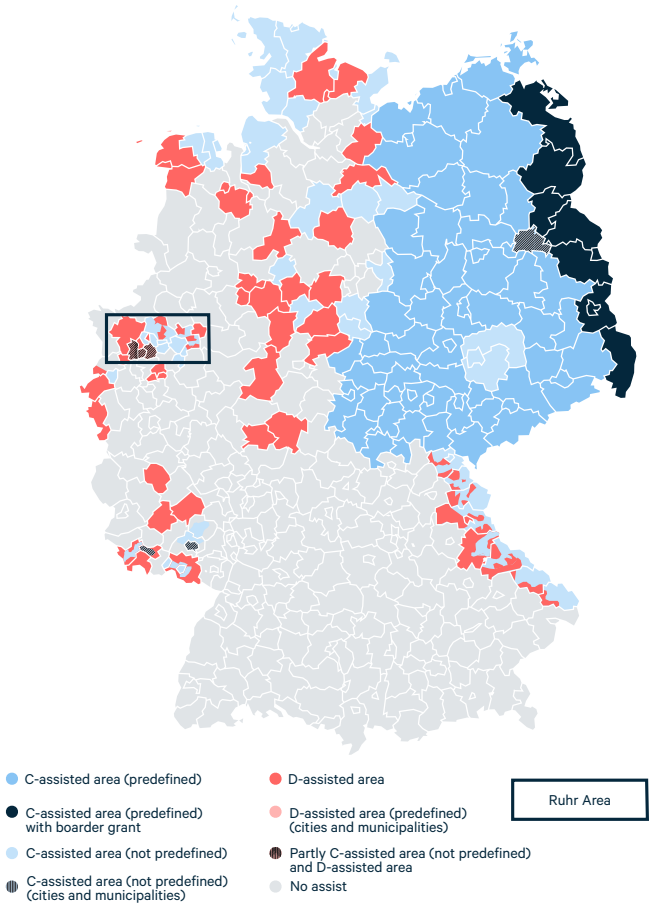
5 The program classifies companies as large if they employ more than 250 people and have either annual sales of more than €50 million or a total annual balance sheet that exceeds €43 million.

2. Loan guarantees to enterprises: The guarantees may not exceed 80% of the loans, and the term may not exceed 15 years.
3. Interest grants: These grants are for interest on loans to finance eligible commercial investment and infrastructural projects. Recipients receive grants for the payment of interest associated with resources provided by the GRW (BMWi 2020e, 45).

5.7.1.4. Indicators and beneficiaries

The national government ranks different regions based on the following factors: (1) average unemployment rate from 2009 to 2012 (weighted 45%), (2) gross annual salary per employee subject to social insurance contributions in 2010 (weighted 40%), (3) employment forecast from 2011 to 2018 (weighted 7.5%), and (4) level of infrastructural development as of September 30, 2012 (weighted 7.5%) (BMWi 2020e).

Figure 9. GRW Funding Area Distribution, 2014–2020



Source: Bundesregierung (2020a).

A region's position in this ranking determines the amount of support it can receive from the GRW. Figure 9 depicts the different funding areas in Germany. The areas in blue correspond to the former East German regions. When Germany was reunified in 1990, these regions received significant shares (above 70%) of the GRW. These regions are considered "predefined" by the GRW, meaning that their funding is not determined by the ranking system. Therefore, reunification led to a decrease in the funding available to regions in former West Germany. Currently, most of the regions supported by the GRW in West Germany are coastal and border regions, in addition to hard coal mining regions. These regional designations are reviewed at regular intervals in accordance with the EU state aid law.

5.7.2. Other business-related measures

Besides the GRW, several other programs provide economic support for structurally weak regions in Germany:

- ERP Regional Program (ERP-Regionalprogramm): The German Development Bank (KfW Bank) grants SMEs loans for investments in structurally weak regions up to €3 million. SMEs can use this support for the acquisition of real estate, building or purchase of fixed assets, and immaterial goods (KfW 2021).
- ERP Capital for Start-ups Program (Programm ERP-Kapital für Gründung): This is a long-term loan program by the National Ministry for Economic Affairs and Energy for start-ups that provides exceptions from collateral warranties for beneficiary companies (BMWi 2020a).
- National Guarantee Program (Bundesbürgschaftsprogramm): The program offers loan guarantees to businesses operating in structurally weak regions. The national government provides guarantees when their volume exceeds €20 million. Risks are distributed equally between the national and *Länder* governments (Bundesregierung 2020a, 4). Otherwise, guarantees are provided by the *Länder* only.
- Germany Trade & Invest: The German economic development agency supports businesses that are active in other countries. It advises domestic businesses and creates connections with foreign partners for cooperation. The agency especially supports businesses in structurally weak regions (Bundesregierung 2020a, 4).

5.7.3. Research and innovation

Regional development programs with a focus on research and innovation are normally under the control of the National Ministry of Education and Research. They include the following:

Innovation and structural change

The National Ministry of Education and Research planned to spend €17 million during 2020 on the Innovation and Structural Change (Innovation und Strukturwandel) program, which supports innovation in structurally weak regions based on their

individual potential and so does not prioritize predefined activities. The volume of the program is supposed to increase significantly in the following years (Bundesregierung 2020a, 4f). This program consists of the following subprograms:

- Regional Commercial Networks for Innovation (Regionale unternehmerische Bündnisse für Innovation): This program supports innovation by SMEs and partners in universities and research institutions. Beneficiaries can choose research topics based on a common strategy. The funding is granted for one to seven months for the conception phase followed by a three-year realization phase. The networks receive grants of up to 50% of the project volume (BMBF 2019b).
- Change via Innovation in the Region (Wandel durch Innovation in der Region): This program mobilizes commercial, scientific, and municipal stakeholders to form networks that engage in regional development. The program is thematically open and provides funding in various fields (e.g., science, social, engineering). Funding is divided into a conception phase and a six-year realization phase. The projects can receive up to 50% of their total costs (BMBF 2019c).
- REGION.innovativ: This program supports existing regional clusters in various fields of innovation to develop and implement new tools and models of work and organization, especially in SMEs. Grants are awarded for working on company-driven and application-oriented R&D topics that require multicompany collaboration, research partners, or other alliances. The grants are awarded for three years and can reach up to 50% of the project volume (BMBF 2019a).

Regional enterprises

The Enterprise Region (Unternehmen Region) set of programs was developed by the National Ministry of Education and Research targeting enterprises in former East Germany with €142 million in funding for the year 2020. The goal is to attract innovative SMEs and connect them with high-skilled workers and scientists in the regions (BMBF 2019d).

Scientific start-ups

Through the Start-ups from Science (Existenzgründungen aus der Wissenschaft) program, the National Ministry for Economic Affairs and Energy supports new innovations by providing (1) scholarships for start-up founders, (2) research transfer for start-ups, and (3) support for universities to promote start-ups and entrepreneurship (BMWi 2020b).

Municipal innovation

The Innovative Municipalities (Kommunen innovativ) program supports research and innovation projects developed by municipalities of less than 100,000 inhabitants. Public companies in those regions are also eligible. Projects funded seek to address some of the consequences of the demographic change via grants for affected municipalities. The projects also create strategies for sustainable urban and regional

development. In 2021, the focus of the program will shift toward equal living conditions and public goods (BMBF 2020a). The funding period is usually two to three years (PTJ 2021).

Research and development

The INNO-KOM program supports nonprofit research institutions in structurally weak regions with grants for (1) commercially oriented R&D projects, from the design until the production phase, (2) preliminary research transferable to SMEs, and (3) improvements in scientific and technical infrastructure. In 2020, the designated funding for the program was €70.55 million (Bundesregierung 2020a).

Innovation grants for SMEs

The central innovation program for SMEs (Zentrales Innovationsprogramm Mittelstand) provides grants for R&D in SMEs and cooperating research institutions in structurally weak regions. Funding is available in all fields of technology. Companies are free to choose their own topics. Important criteria for funding are innovative content and good market prospects. The program supports individual projects, cooperation projects (from two or more companies), and networks (of at least six companies). The funding volume was €555 million in 2020, which makes it the largest program for SMEs (BMWi 2020f). The maximum volume for projects amounts to €380,000, of which up to 55% can be granted by the program.

5.7.4. Labor force training

The Intercompany Vocational Training Centers (Überbetriebliche Berufsbildungsstätten; ÜBS) program supports the construction and expansion of vocational training institutions. The ÜBS program helps SMEs that, because of lack of resources, cannot acquire machines needed for mandatory skills training during apprenticeships. In addition to its support of employing companies and vocational schools, the ÜBS program plays a supporting role in the training of skilled workers in Germany. The funding is distributed by the ÜBS sponsors (mostly chambers of crafts, industry, and agriculture) and comes from the budgets of the national ministries of education and economics. A total of €101 million was available for 2020 (BMBF 2020b). Projects in structurally weak regions receive a 15% higher funding rate.

5.7.5. Digitalization

Given current gaps in digital infrastructure in Germany, especially in comparison with other countries in the European Union, the broadband funding (Breitbandförderung) program of the National Ministry of Transport and Digital Infrastructure seeks to provide nationwide coverage of gigabit networks. In regions where market mechanisms are not sufficient to expand the networks, the national government provides funding via this program. Municipalities can receive support in the form of grants for expansion projects. The maximum support for a project is €30 million. Private individuals and

companies are excluded from this program. Depending on the region, the national contribution corresponds to 50%–70% of the project's volume. This support is up to 90% of the total volume of the projects (Gigabit.NRW n.d.). In the case of financially weak municipalities, the *Länder* can cover the remaining 10% of the project (BMVI 2020).

The Digital Now (Digital jetzt) program provides funding for digitalization projects in SMEs. A total volume of €40 million was available for 2020. The program also provides companies with assistance in the application process and developing a digitalization plan (Bundesregierung 2020a). Grants are provided for investments in digital technologies and training employees (BMWi 2021b).

The City.Countryside.Digital (Stadt.Land.Digital) initiative is a consulting program implemented by the National Ministry for Economic Affairs and Energy, which supports relevant stakeholders in developing strategies for further digitalization. The program organizes networking meetings, develops studies, and disseminates information about best practices in digitalization. The funding volume for 2020 was €2 million (Bundesregierung 2020a).

5.7.6. Rural and urban development

Rural development and agriculture

The Joint Task for Improvement of the Agricultural Structure and Coastal Protection (Gemeinschaftsaufgabe "Verbesserung der Agrarstruktur und des Küstenschutzes") supports projects for the development of agriculture and rural areas with grants and loan guarantees. Start-ups, associations, private individuals, public institutions, municipalities, and companies are eligible for funding (BMWi 2020c). The funds come from the National Ministry of Food and Agriculture. The program supports measures in the following areas: rural development; promotion of agricultural enterprises; improvement of marketing structures; market, site-adapted, and environmentally friendly land management; nature conservation; landscape management; forestry; health and robustness of farm animals; and water management. Other measures include coastal protection, preventive flood protection, and insect protection in agriculture.

The Planning Committee for Agricultural Structure and Coastal Protection, consisting of one representative of each *Länder* and representatives of the national government, particularly the ministers of agriculture (chair of the Planning Committee) and finances, decide which measures are funded. The *Länder* then implement this framework plan with their own development programs and supplement it with their own funding measures. The implementation of the projects is the sole responsibility of the *Länder*. For 2020, €200 million was available for funding (Bundesregierung 2020a).

Urban development

The main goals of the support for urban development are the following: (1)

strengthening urban centers and protecting historical monuments; (2) developing sustainable urban structures in areas affected by a loss of urban function (marked primarily by an oversupply of built structures, such as vacant housing, or brownfield sites in inner cities, especially former industrial and railroad sites); and (3) creating measures to enhance social integration, promote intergenerational justice, and meet the needs of families.

Funding for urban development is the responsibility of the National Ministry of the Interior, Building and Community. The national government provides financial support to the *Länder*, which contribute additional funds for the urban development of municipalities. In 2020, €790 million was earmarked for this purpose (Bundesregierung 2020a).

5.8. EU support for Germany

The European Union supports its member states with a variety of programs and funds that are beneficial for coal regions. For Germany, this support consists of the following programs:

- European Structural and Investment Funds (approx. €29 billion, 2014–2020) (BMWi 2021d)
- European Agricultural Support (direct payments) (approx. €7 billion for 2020) (BMEL 2021)
- European Research and Innovations Support ("Horizon 2020") (approx. €75 billion until 2020, EU wide) (BMBF 2021)
- European Just Transition Mechanism (upcoming)

The following sections present a brief description of the most important programs for coal regions in Germany.

5.8.1. EU Structural and Investment Funds

Between 2014 and 2020, Germany received around €29 billion from the Structural and Investment Funds (BMWi 2021d), which consist of four different types:

- European Fund for Regional Development (EFRD)
- European Social Fund (ESF)
- European Agricultural Fund for Rural Development
- European Maritime and Fisheries Fund

For coal regions, especially important are the EFRD and ESF. In Germany, the *Länder* are mainly responsible for the allocation of these funds.

5.8.1.1. EFRD

The purpose of the EFRD is to create social and economic cohesion among the subnational regions of the EU member states. It supports investments to improve the competitiveness of companies and create jobs in SMEs and measures that promote energy efficiency, research and technological development, and environmental protection (BMWi 2017, 2). The German regional development program GRW is closely connected to the EFRD. Both programs share similar funding areas, and many projects are co-financed. Germany received around €11 billion from the EFRD from 2014 to 2020 (BMWi 2017, 2).

The National Ministry for Economic Affairs and Energy represents Germany at the EU level and is responsible for the communication and development of a coherent strategy for the fund with the *Länder* (BMWi 2021a). It therefore acts as a coordination office. However, each *Länder* decides which projects receive funding. Currently, 15 *Länder*-specific programs are supported by the EFRD (Untiedt et al. 2019, 10).

5.8.1.2. ESF

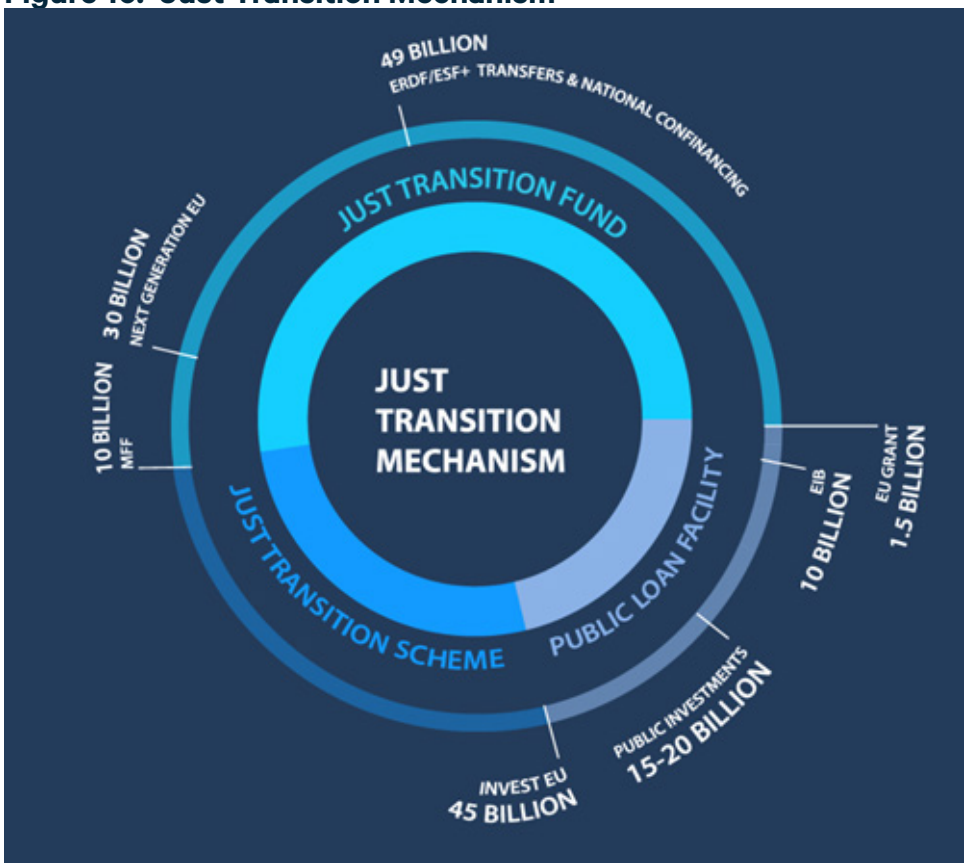
The ESF is the European Union's most important instrument for social inclusion and combating poverty. Its main goal is to support long-term unemployed people, residents with migration backgrounds, and disadvantaged young people in their integration into society and the labor market. It also supports SMEs and start-ups to improve competitiveness and incorporate skilled workers. Through educational measures, the ESF increases the qualification of workers. Germany received around €7.5 billion from the ESF in 2014–2020 (BMWi 2017, 2).

The *Länder* are responsible for allocating the resources of this fund. This results in different *Länder*-specific programs. However, according to German law, the national level is in charge of social policy, adding a national-level ESF program (Untiedt et al. 2019, 10). Thirty-five percent of the ESF's budget for Germany is allocated to the national program, and the rest (€4.8 billion) is split among the *Länder* (Bundesregierung 2014). The allocation strategy is developed mainly by the National Ministry of Labour and Social Affairs in cooperation with the national ministries for economic affairs, education and research, family, interior, and the environment. The national operational proposal is then discussed with the *Länder* and developed. The national program builds the framework for each funding period.

5.8.2. EU Just Transition Mechanism

The Just Transition Mechanism (JTM) was proposed in early 2020 and is the European Union's key policy to enable JT away from carbon-intensive economies (see Figure 10). The JTM serves as the socioeconomic framework for decarbonization measures of the European Green Deal. It consists of three pillars: the Just Transition Fund (JTF), the InvestEU JT scheme, and the European Investment Bank (EIB) public sector loan facility (EC 2020c). These pillars combined are supposed to mobilize at least €150 billion in 2021–2027.

Figure 10. Just Transition Mechanism



Source: European Parliamentary Research Service (2020).

5.8.2.1. Just Transition Fund

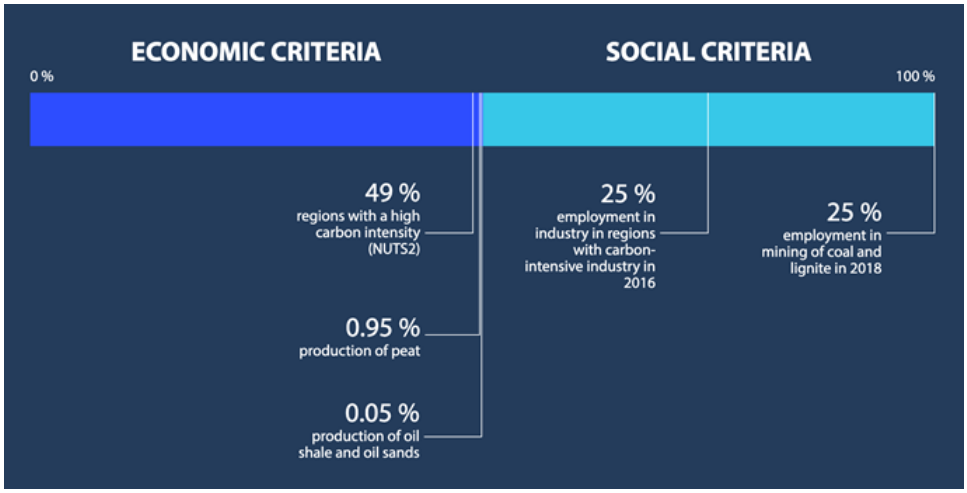
The JTF is the core of the JTM. It was proposed at the beginning of 2020. The investments enabled by the JTF will benefit SMEs, research and innovation, renewable energies, emissions reduction, clean energy technologies, site redevelopment, the circular economy, and upskilling and reskilling of workers. The funding is available for all EU countries and will be allocated according to the following socioeconomic criteria (see Figure 11; European Parliamentary Research Service 2020):

- Industrial emissions in regions with high carbon intensity
- Employment in industries in these regions
- Employment in coal and lignite mining
- Production of peat production of oil shale and oil sands

The initial volume of the JTF is only €7.5 billion (European Parliamentary Research Service 2020). This is supposed to be complemented by transfers from other EU funds, such as the ERDF and ESF (see Section 5.8.1), and national co-financing. The initial

€7.5 billion is topped up with €2.5 billion from the amended 2021–2027 Multiannual Financial Framework proposal, which adds €30 billion in transfers from the Next Generation EU.[6] Therefore, the overall financing capacity of the JTF, including transfers and national co-financing, is supposed to equal €89 billion, according to the European Union's proposal from May 2020.

Figure 11. Allocation Criteria of the JTF



Source: European Parliamentary Research Service (2020).

Germany will receive €13.4 billion between 2021 and 2027, of which €5.2 billion is from the Multiannual Financial Framework and Next Generation EU and €8.5 billion from ERDF/ESF and national co-financing. However, debate about the actual distribution of this funding is ongoing. The *Länder* governments fear that the JTF will not provide additional benefits to the mining regions but instead help the national government to finance the measures included in the Structural Strengthening Act (SSA; see Section 5.9.2) (Klemp and Budke 2020). The) National Ministry for Economic Affairs and Energy confirmed that the government is not planning additional support via the JTF for the regions and that instead these funds will be used to finance measures of the SSA, under the argument that the SSA's funding volume was consensually defined with the mining regions and *Länder* and therefore no reason exists to increase this volume with the JTF (BMWi 2020i).

5.8.2.2. InvestEU JT scheme

InvestEU combines several EU financial instruments under one roof. It also forms an investment program of the European Union with its own fund and counseling platform. Its dedicated JT scheme is supposed to be the second pillar of the JTM (EC 2019). The

6 Next Generation EU is a €750 billion COVID-19 EU recovery fund for 2021–2023.

InvestEU JT scheme will support "sustainable infrastructure,"[7] research, innovation and digitization, SMEs, social investment, and skills development. The goal of this program is to back mostly private projects with public loan guarantees from the European Union. However, it is questionable whether the program's support will reach the projected €45 billion in investments. So far, only €1.8 billion has been provided for JT objectives (EC 2020b). The remaining €43.2 billion is expected to come from private sources. Furthermore, critics doubt the program's focus on JT, especially because it enables support for investments in gas infrastructure, assets that will be stranded in just 15 years if the Paris Agreement is taken seriously (Gentiloni 2020).

5.8.2.3. European Investment Bank loan facility

The EIB loan facility is the planned third pillar of the JTM. This loan facility is supposed to enable the public sector to invest in energy and transport infrastructure, district heating networks, energy efficiency measures, public transport, social infrastructure, and other projects that reduce the socioeconomic costs of the energy transition (EIB 2020). The projects must be located in regions eligible for funding. Furthermore, the projects must demonstrate a need for public support. For this purpose, €1.5 billion from the EU budget is planned, which, together with the EIB fund, will provide loans for the public sector amounting to €10 billion. Total public investment in Europe should then be €25–30 billion for 2021–2027 (EIB 2020). How much will be allocated to Germany is still unclear.

5.9. CC and coal exit laws

5.9.1. Coal Commission

5.9.1.1. Overview

In June 2018, the national government convened the CC. This multistakeholder initiative included representatives from the government, workers, coal regions, trade associations, environmental groups, and research institutions. The goal was to cooperatively chart a roadmap for phasing out the remaining coal and lignite-fired power stations and lignite mines.

The national government requested that the CC provide policy recommendations for the phaseout to "ensure that Germany reduces emissions as far below its 40% target while meeting its stated objectives of supply security, affordability and the safeguarding of jobs and value-added and that the energy industry reliably meets its sector goals for 2030" (BMWi 2019, 3). Other key benchmarks were

7 The European Union recently announced the following projects regarding "sustainable infrastructure": sustainable transport and road safety, rail and road infrastructure, renewable energy, energy efficiency renovation projects, digital connectivity, and environmental and climate resilience research (European Parliament 2020).

environmental sustainability, market competitiveness, social acceptability, social cohesion, and planning and legal security. In January 2019, the CC published its final recommendations, including a phaseout date of 2038.

In an altered form, CC recommendations were passed in two laws, termed the coal exit laws: the SSA (see Section 5.9.2) and the CPGTA (see Section 5.9.3).

5.9.1.2. Administrative structure

Management and composition

The CC functioned as an independent institution. It had 28 members selected by the national government, including four chairpersons (see Table 12). The national government supported the CC's work through the administrative management of the National Ministry for Economy and Energy and a committee of state secretaries, consisting of representatives of several national ministries, directly participating in the meetings. Three members of the Bundestag and representatives of six *Länder* also participated in the meetings as nonvoting members.

The CC decided to divide its members into two working groups: "energy industry and climate targets" and "economic development and jobs in the regions." Both groups were open to all members.

Table 12. Coal Commission Members

Members with voting rights	
Commission chairs (4)	Stanislaw Tillich (CDU, former state premier of Saxony, a lignite mining state), Matthias Platzeck (SPD, former state premier of Brandenburg, a lignite mining state), Barbara Praetorius (climate economist, former deputy director at Agora Energiewende), Ronald Pofalla (CDU, former chief of the chancellery, now board member at Deutsche Bahn)
Additional members (24)	Representatives of universities and research centers (6), environmental groups or advocacy (4), political parties (2), mining regions and communities (2), utility companies (3), unions and worker associations (4), industrial and business sectors (3)
Members without voting rights	
Representatives of national ministries (8)	National Ministry for Economic Affairs and Energy (also hosts the commission's secretariat); National Ministry for the Environment, Nature Conservation and Nuclear Safety; National Ministry of the Interior, Building and Community; National Ministry of Labor and Social Affairs; National Ministry of Finance; National Ministry of Transport and Digital Infrastructure; National Ministry of Food and Agriculture; National Ministry of Education and Research; national chancellery (guest status)
Representatives of national states (6)	North Rhine–Westphalia (NRW), Saxony, Brandenburg, Saxony-Anhalt, and Lower Saxony and Saarland
Members of parliament (3)	Andreas Lämmel (CDU), Andreas Lenz (CSU) and Matthias Miersch (SPD)

Notes: CDU, Christian Democratic Union; CSU, Christian Social Union; SPD, Social Democratic Party.

Meetings

The CC held its first of 10 plenary meetings on June 26, 2018, and the closing meeting on January 25, 2019. During the initial meetings, experts from different institutions presented on key topics (e.g., core data on lignite mining areas, socioeconomic conditions and structural change, climate policy and energy industry fundamentals, and regional value creation). The CC also requested several independent studies to support its work. All meetings took place in Berlin. However, the CC also undertook field trips to the three lignite regions, in which CC members met representatives from local communities and institutions. In its final meeting, with 27 votes in favor and one against, the CC approved the final recommendations, surpassing the two-thirds quorum required. The National Ministry for Economic Affairs and Energy then published a final report, which included only the content that received unanimous approval. For this reason, many important elements needed for the definition of the coal phaseout plan were left out of the recommendations provided by the commission.

5.9.1.3. Recommendations

The CC recommendations can be divided into six areas: (1) general assumptions, (2) structural policy, (3) employment protection, (4) environmental remediation, (5) climate protection, and (6) energy markets and reliability. The following sections describe the first four recommendations, which are the most relevant for JT in coal regions.

General assumptions

Some of the CC's key recommendations correspond to general assumptions that need to be considered for a coal phaseout process that is socially just for coal workers and communities:

- Social acceptability: A phaseout plan built through a multistakeholder and consensually based process is fundamental to ensure broader legitimacy. To enhance acceptance, build trust, create identification with the structural change, and accelerate the process, it is necessary to incorporate the views of individuals living in coal regions.
- Legal security: A phaseout plan based on legal security is fundamental to safeguard the long-term development of the measures recommended. Legal security is also important for planning reliability within the energy industry and among workers and local communities. Therefore, a comprehensive legislative package is needed to ensure that the structural development aid will be legally and institutionally protected.
- Local coherence: Policies to support the structural change of mining regions need to consider the features of each region, including its cultural identity. Actors and inhabitants in the affected regions need to shape the structural development through their engagement and ideas. Therefore, programs defined by policymakers must support this development while allowing local involvement.
- Institutionalization and coordination: The structural development of coal

regions should be institutionalized with a strong organizational structure, in which responsibilities are split between the national, *Länder*, and municipal governments.

- Additionality: The structural development must be addressed in addition to other structural assistance programs and existing support for regional development. Therefore, existing subsidy programs to create equal living conditions throughout Germany should be set apart from the support for mining regions to avoid overlaps and friction.
- Monitoring and flexibility: The recommended phaseout plan includes regular reviews and continuing and long-term monitoring. A balance between legal certainty to protect key aspects of the plan and the capacity to incorporate changes in other aspects is important for flexibility and planning.

Structural policy

Structural policy is a key concept in the history of regional development policymaking in Germany (see Section 3.2) and a central target of the CC. The commission defines structural policy as a package of measures to promote the structural development of coal regions and to "face the challenge of safeguarding existing value chains and developing new ones, but also the opportunity to shape the impending structural change through innovation in a sustainable way" (BMWi 2019, 2). Regions and cities dependent on coal power production are also included in these structural policies.

The commission recommended the following structural policies:

1. Structural development budget: An initial investment incentive for coal regions should be created in 2019–2021. Moreover, the national government should create an extra budget allocation of approximately €2 billion per year for 20 years to secure the structural policy measures in the medium to long term. A special funding program should also be created to improve transport infrastructure. The commission expects the national government and the *Länder* to agree on their respective shares of the funding.
2. Development of the affected mining regions as energy regions equipped for the future: Existing energy infrastructure provides a locational advantage for the construction of new energy production systems and energy storage capacity. Subsidies need to be created to promote the redevelopment of affected regions as clean energy regions, which should improve their technological competence and innovative capacity and provide for the adoption of clean energy technologies (e.g., renewable energies, storage capacity, green hydrogen). The same applies to the construction of new gas-fired power stations in existing power station locations.
3. Development of new strategies for mining regions based on their strengths: Strategies must be developed and implemented at an early stage, based on practical measures and the involvement of local participants. Based on consultations in the mining regions, the CC's final report includes specific considerations for each region and some specific recommendations for structural policy strategies. The following are some of the key recommendations:

- Expanding and modernizing infrastructure: Policies must improve inadequate infrastructure for the supply of goods, mobility, and communication systems. This is especially important in regions that are not well connected to metropolitan areas. Modern and efficient transport and digital infrastructure are key priorities for the development of coal regions.
- Reducing dependency on metropolitan areas: New commercial and industrial centers are required to reduce dependency on industrial and metropolitan areas.
- Strengthening existing economic activities: Regions must expand their range of industrial production to attract new businesses. Structural policies should promote regional industrial clusters, sustainable industrial processes, and new technological developments.
- Attracting skilled workers: Steps must be taken to counter demographic decline and the lack of skilled workers. Attractive connections with metropolitan regions need to be developed, and measures must be adopted to retain and train skilled personnel in the regions.
- Preserving successful training institutions: Existing apprenticeship and training structures in mining regions need to be preserved and used in the development of a high-skilled workforce. An important example is the apprenticeship and training facilities of the LEAG lignite company in Lusatia.
- Creating new research networks and strengthening existing academic and research structures: Existing research infrastructure needs to be supported, and new institutional networks need to be created to harness the research and development potential of the regions. Especially key is developing research on clean energy technologies and structural development (e.g., Structural Transition Institute in Halle, Max Planck Institute for transformation research in Rhineland, Saxon Institute for Energy and Transformation Research in Lusatia).
- Developing innovation hubs and development potentials in key technologies: Industrial innovation centers need to be created to promote cooperation among industrial companies, digital start-ups, universities, and research institutes. Particular attention should be paid to technologies in the areas of digitalization, power-to-X, storage, industrial hydrogen-based energy production, low carbon industrial processes, energy efficiency, automation, and robotics.
- Creating new social infrastructures and recreation facilities: The quality of life in the regions must be improved by creating attractive social infrastructures (e.g., schools, hospitals) and recreation facilities.
- Reinforcing existing initiatives for the structural transition: In many regions, initiatives to support the structural transition are already in place (e.g., Rhineland Mining Area Future Agency). These initiatives should be supported and expanded.
- Strengthening the presence of the public sector: The presence of public authorities or institutions in mining regions will need to be extended in the next few years, especially by opening branches of public authority offices and agencies or relocating offices to the mining regions. This will underline

the commitment of the national and *Länder* governments to the future of the coal regions and will also create new jobs and stimulate local purchasing power.

The commission also recommends that the selection of projects to implement structural policies in each region should be based on the following criteria: (1) structural effectiveness and positive effect on jobs; (2) financial stability; (3) environmental and social sustainability; (4) contribution to the future and innovation potential; (5) regional significance and regional roots; and (6) networking, cooperation, and integration of the relevant civil society stakeholders.

Employment protection

A central objective of the plan recommended by the CC is to ensure the protection of existing high-skilled jobs in the coal industry and to provide new high-skilled and sustainable jobs (BMWi 2019, 9). Protected jobs may include current positions in open-pit mining and in lignite and coal-fired power stations. The primary measure recommended is a socially equitable retirement of existing coal-fired generation. This measure includes the following:

- Securing funding for employment protection: Sufficient funds for employment protection must be available for the entire lignite and coal mining and power generation sector.
- Job guarantees for employees and apprentices: All employees in open-pit mining and lignite and coal-fired stations must be given viable career prospects and a chance to find future-proof jobs with adequate remuneration and working conditions. Practical prospects for new, future-proof jobs in the affected regions need to be created. The prospects must consider future shifts in the job market and fulfill standards of high-quality jobs with collective wage agreements and mandatory social insurance.
- Early retirement compensation (adjustment benefit): Older employees in lignite mining and power stations will require special job guarantees, and sufficient funds from the national government must be earmarked to finance this. Where necessary, the legal options to claim early retirement must be used. Arrangements must be developed with the national government for an adjustment benefit to cushion the necessary reduction in personnel for all employees above the age of 57. Early retirement and pension deductions must be compensated.
- Binding collective agreements: Mutually agreed contractual provisions must be used to protect key deals and should include placement in skilled jobs, compensation for lower wages, apprenticeships and vocational training, compensation for early retirement, assistance in obtaining adjustment benefits, and compensation for pension deductions. The employees' representative bodies and trade unions must be included in the negotiations, and the provisions must be fixed in collective agreements.
- Preserving jobs in power plants: Transferring existing coal-fired power stations to a security standby pool can be helpful to preserve a significant portion of jobs for

the future. Retrofitting power plants from coal to gas can also help preserve jobs. Local authorities should take advantage of existing energy infrastructure and operating permits to protect jobs in power plants.

Environmental remediation

The CC recommended the following environmental remediation measures:

- Securing funding for postmining costs: Under the National Mining Act, the most important piece of legislation governing mining in Germany, operating companies must bear the costs of remediation after coal and lignite extraction. The CC recommends that owners of lignite companies use compensation payments included in the phaseout plan to cover postmining costs. To achieve this, the *Länder* should provide insolvency-proof guarantees in the absence of joint corporate liability schemes.
- Cost transparency: To understand the financial consequences of closing open-pit mines, the CC suggests that in addition to the present annual financial statements, operators of coal mines should be required to provide data about the availability of funds for future remediation projects. The CC recommends that the right to obtain this information be given to a state body.
- Binding agreement on water management: A binding agreement must be made to ensure that water management is guaranteed in the event of a premature phaseout of lignite mining.

5.9.2. SSA

5.9.2.1. Overview

The Structural Strengthening Act (SSA; Strukturstärkungsgesetz) was passed in 2020 to legally implement most of the recommendations of the CC in terms of structural policy. The act is intended to support lignite regions and locations economically dependent on coal-fired power plants. It establishes that €14 billion from the national government will be destined for investments in cities and municipalities of lignite regions. A further €26 billion will be made available from the national government through support programs (new and existing) or in the form of infrastructure projects. The funding period runs from 2020 to 2038, but projects can receive funding beyond that date if they are completed by 2041.

5.9.2.2. Administrative structure

The National-*Länder* Coordination Committee (Bund-*Länder*-Koordinationsgremium) oversees the implementation of the programs financed by the SSA. It includes the national government and the lignite *Länder* (Brandenburg, Saxony, Saxony-Anhalt, and NRW). The national government is represented by the National Ministry for Economic Affairs and Energy (chair) and other relevant ministries. The *Länder* are represented by the heads of the chancelleries from Brandenburg, NRW, and Saxony-Anhalt, as well as

the minister for regional development of Saxony (BMWi 2020g).

All measures to be financed must be approved by this committee to ensure that the money is used in relevant projects. The full committee consists of a steering committee at the *Länder* secretary level and a technical committee at the operational level. Controversial topics that might come up are first forwarded to the technical committee, which may refer questions of principle and cases of particular importance to the steering committee. The steering committee may appoint an advisory board of experts to provide technical support, especially to assess the effectiveness of individual programs or projects (BMWi 2020h). Both committees decide what projects will be financed with the vote of the national government and at least half of the votes of the *Länder*. Each *Länder* has one vote. A recommendation cannot be decided against the vote of the national or *Länder* department concerned (BMWi 2020h). The panel has decided on measures and distribution of funds for the regions for 2020 and 2021 (BMWi 2020g).

5.9.2.3. Programs and qualified entities

The main components of the structural policy for coal regions defined by the SSA are (1) financial support for lignite regions, (2) extension of existing and development of new support programs, (3) financial support for regions with hard coal power plants, and (4) noninvestment expenditure support (STARK program).

Financial support for lignite regions

The SSA financially supports the three active lignite regions in 2020–2038. The €14 billion budget will be made available to municipalities and cities in the regions for investment projects of particular importance:

- 2020–2026: €5.5 billion
- 2027–2032: €4.5 billion
- 2033–2038: €4 billion

The grants will be awarded to the regions only after an assessment by the National Ministry for Economic Affairs and Energy, which will corroborate whether the level of closure of lignite plants achieved corresponds to the amount required by the CPGTA (see Section 5.9.3) for the period (Bundesregierung 2020d).

Extension of existing and development of new support programs

Coal regions will receive an additional €26 billion via support programs. This support comes from existing and new national programs. In addition, direct investments in infrastructure will be created in the regions, particularly to improve connectivity between rural and metropolitan areas. The specific projects are financed and designed by various national ministries. A selection of projects already approved includes the following (BMWi 2020h):

- Establishment of new branches of the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt) research institute in coal regions (National Ministry for Economic Affairs and Energy).
- Financial support for strategic business and managerial consulting projects for companies affected by the structural change (National Ministry for Economic Affairs and Energy).
- Transportation projects (e.g., the extension of highway and railway systems; public transport and ring roads) (National Ministry of Transport and Digital Infrastructure).
- Establishment of research institutes and competence centers (Kompetenzzentrum), which are institutions that provide research and advice for companies, municipalities, and other organizations on specific topics, such as digitalization in SMEs (National Ministry of Education and Research).
- Establishment of competence centers for climate protection, Power-to-X, electromagnetic fields, and other topics (National Ministry for the Environment, Nature Conservation and Nuclear Safety).
- Project for artificial intelligence in medicine (National Ministry of Health).
- Cultural funding programs (National Commissioner for Culture and the Media).
- Competence center for regional development and sports promotion (National Ministry of the Interior, Building and Community).
- Project for biomass research (National Ministry of Food and Agriculture).

Financial support for regions with hard coal power plants

Municipalities with hard-coal-fired power plants will receive financial support totaling €1 billion. However, this is conditional on the regions having structural weakness and the power plant being of major importance in the local economy (Bundesregierung 2020d).

Noninvestment expenditure support program

The STARK program for noninvestment expenditures, developed by the National Ministry for Economic Affairs and Energy, was designed to support the sustainable transformation of coal regions. Projects are designed to encourage the active participation of residents from the regions. Funding through this program has been possible since August 2020 and is, in principle, open to all legal entities. The program does not support fixed costs but rather running costs, such as personnel, rent, and office materials. STARK is intended to close a gap in regional funding and the lack of enough programs supporting noninvestment expenditures. The following areas are eligible for support from STARK: networking, knowledge and technology transfer, consulting, qualification/training and continuing education, sustainable adaptation of public services, planning capacities and structural development companies, public spirit and common understanding of the future, foreign trade, scientific monitoring of the transformation process, strengthening of entrepreneurial action, and innovative approaches (BAFA 2020).

5.9.3. CPGTA

5.9.3.1. Overview

The Coal Power Generation Termination Act (CPGTA; Kohleverstromungsbeendigungsgesetz) regulates the phaseout of hard coal and lignite consumption in the energy sector in Germany. The law also defines mechanisms to support employees of the coal industry.

5.9.3.2. Energy economic regulations

The CPGTA, passed in 2020, stipulates the phaseout of lignite and hard coal in the power sector by 2038 and 2035, respectively. An earlier phaseout date of 2035 can be defined by a revision of the law in 2029. Under the CPGTA, a larger proportion of the power plants will be shut down later than recommended by the CC, limiting the possibility of meeting national climate targets. In addition, a study commissioned by the National Ministry for Economic Affairs and Energy shows that the CC's shutdown plan would not require demolishing any more villages (Ritzau et al. 2020). However, this cannot be guaranteed with the phaseout timetable specified in this law. Moreover, under the CPGTA, operators of lignite-fired power plants are granted compensation payments, which will be regulated in more detail in a public law contract between Germany and the operators (see Box 6) (Matthes et al. 2020).

Box 6. Public Law Contract Between Germany and Lignite Producers

The German government has negotiated a public law contract with the operators of lignite-fired power plants that guarantees compensation payments of €4.35 billion. In return, the operators waive their right to sue the government regarding the coal phaseout. The fixed shutdown dates and compensation amounts were privately negotiated between the government and the lignite operators. Critics see these payments as far too high, as many of the power plants are no longer profitable. As a result, compensation is provided to power plants that would have been shut down anyway (Matthes et al. 2020). Another problem with these contracts is that they prevent future governments from renegotiating an earlier coal phaseout. In addition, a potential phaseout in 2035 is limited by a clause in the contract that stipulates that closure in 2035 would require notification eight years in advance.

5.9.3.3. Worker adjustment money

Workers from hard-coal-fired and lignite-fired power plants and opencast lignite mines who will lose their jobs because of the CPGTA will receive adjustment money for a maximum period of five years until they reach the qualifying age for pension benefits. Previously, workers in these mines and power plants were excluded from the adjustment money (see Section 5.6.2.2). Only during the rapid reduction of lignite production in former East Germany after reunification (1990–1996) did workers receive similar benefits (Bundesregierung 1999, 1).

In addition to the adjustment money, workers receive contributions to their health insurance. Workers who are over 58 years at employment termination are eligible for both benefits. Moreover, eligibility only applies to job losses due to the CPGTA until

2043. Eligibility for adjustment money also applies to employees in subsidiaries or partner companies if they work almost exclusively for the main companies affected (BAFA 2021). To be eligible for the adjustment money, the employee must have worked continuously for one of the affected companies on September 30, 2019, and for the last two years prior to the employment termination. Pension reductions resulting from the early claiming of a pension after the adjustment allowance can be compensated by payments of corresponding contributions from the National Office for Economic Affairs and Export Control directly to the statutory pension insurance. This office also manages and grants the adjustment money. The employer is responsible for applying for the adjustment money for its employees during the process. The adjustment money is calculated based on the pension entitlements of the applicant in the statutory and/or miners' pension insurance at the time of employment termination. Like statutory pensions, the adjustment money is adjusted annually. It is possible to earn additional income while receiving the adjustment money, but 30% of this income is offset against the adjustment money (BAFA 2021).

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