Phasing out coal – a just transition approach

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Abstract

The clock is ticking and time is running short for us to have a realistic chance to get climate change under control and prevent it becoming irreversible and self-sustaining. Phasing out coal is widely seen as a 'low hanging fruit' of climate policy commitments in the move towards a net zero carbon* economy by 2050. Coal-based energy generation and use made up 15 per cent of total EU greenhouse gas emissions in 2017; while, at the same time, these have a rather low share in the total economy and employment. On the other hand, coal-dependent activities are concentrated in a small number of European regions where they provide the main basis for the economy, employment and the livelihoods of people. If properly-designed just transition policies can have a meaningful effect, then coal transition is the right place to start.

The focus of this working paper is to find out what a just coal transition might look like in practice.

After summing up the role of coal in the European economy and in employment, the current employment structure of the broader coal sector will be examined in greater detail. Then, by discussing the drivers and challenges of coal transition, we will provide an insight into the phasing out of coal and the related introduction of just transition policies in a number of EU member states. This working paper will conclude that, in order to fulfil mid-century climate policy targets and manage a successful phase-out of coal in the energy sector, specific and targeted just coal transition policies should be applied.

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* A net zero carbon economy (or reaching carbon neutrality) refers to achieving net zero carbon dioxide emissions by balancing carbon emissions with carbon removal (often through carbon offsetting) or simply eliminating carbon emissions altogether.

Introduction

The Paris Agreement (UNFCCC 2015) was undoubtedly a historical milestone, with commitments by almost 200 nations to transform their development trajectories in order to limit global warming by 2100 to 1.5 to 2 degrees Celsius above pre-industrial levels. The main lesson from Paris was, however, that national pledges would be likely to deliver a temperature increase of at least 3°C by 2100 and would only bring one-third of the reduction in emissions required by 2030 to be on track towards climate targets (UNEP 2017). In the absence of significantly greater ambition, the carbon budget of a 2°C scenario will be almost depleted by 2030. At the same time, an IPCC (2018) report ahead of the COP24 Katowice Summit pointed to the dramatic difference between 2°C and 1.5°C warming scenarios, making a strong case for why sticking to the more ambitious target is vital.

Climate policy ambition thus needs to be stepped up and a radical change is of course needed in order to reach a net zero carbon economy at global level in the second half of the century. In its Communication ahead of the COP24 Summit, the European Commission (2018a) set the long-term objective of a climate neutral Europe by 2050. This transition will affect every aspect of how we produce goods, provide services, move around and consume.

Getting climate change under control in line with the Paris objectives will not be possible without the timely phase-out of the use in power plants of unabated coal. Coal makes up 27 per cent of all energy used worldwide, and 38 per cent of electricity generation; it plays a crucial role in energy supply for industries such as iron and steel and is responsible for 44 per cent of global CO_2 emissions (IEA 2018).

Coal, as a main source of greenhouse gas emissions, has no future in meeting energy demands for the next generations but, at the same time, workers in the coal industry and in coal regions need to be able to have a future.

In this working paper we focus on the energy sector and, in particular, on the phasing-out of coal in energy generation and dealing with its employment and social effects. After framing the main challenges, section 1 will sum up the role of coal in the European economy and in employment. Section 2 will examine past trends and the current employment structure of the broader coal sector. Section 3 will discuss the drivers and challenges of coal transition. Section 4 will provide an insight into coal phase-out plans in EU member states. Section 5 will argue why the principle of 'just transition' has an eminent role in managing coal transitions and what policies could be most relevant. Section 6 draws some lessons from

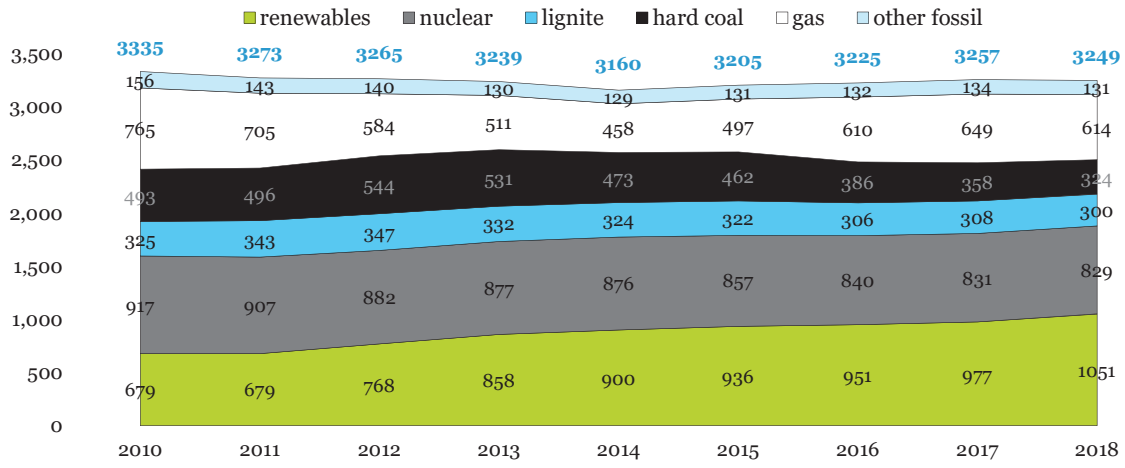
previous just transition cases that have involved coal regions. Section 7 will take a look at a number of national energy plans from the point of view of just transition policies. Conclusions and recommendations follow.

1. Europe's changing energy mix

The EU's share in global coal-based electricity generation was just seven per cent (2017) and, while the world on average still had a 38 per cent share of coal in generating electricity, in Europe it was just above twenty per cent (IEA 2018). In 2016, there were 128 coal mines in 12 EU member states and 41 regions, with a total annual output of 500 million tonnes making up sixty per cent of gross EU coal consumption. The other forty per cent of the gross consumption of solid fuels (almost entirely hard coal) in the EU was covered by imports, making up 4.9 per cent of the EU's total energy imports (Eurostat 2018). There were 207 coal-fired power plants in operation in 21 member states in 103 regions, with a total capacity of 150 gigawatts (GW), making up 15 per cent of total European power generation capacity. Coal infrastructure was thus present in 108 European regions (Alves Dias *et al.* 2018).

Figure 1 shows the composition of the European fuel mix and the trends between 2010 and 2018. Total energy generation in the EU-28 grew in the three consecutive years between 2014 and 2017 and resulted also in rising fossil fuel-based power generation (hard coal, lignite, gas and oil). Even though there was an expansion of wind energy generation, higher electricity demand led to an increase in fossil fuel generation as a result of a fall in hydro and nuclear generation.

Figure 1 **Electricity generation by fuel type and changes in composition (2010-2018), EU-28 in terawatt hours (TWh)**



Source : Eurostat, Agora Energiewende and Sandbag (2019)

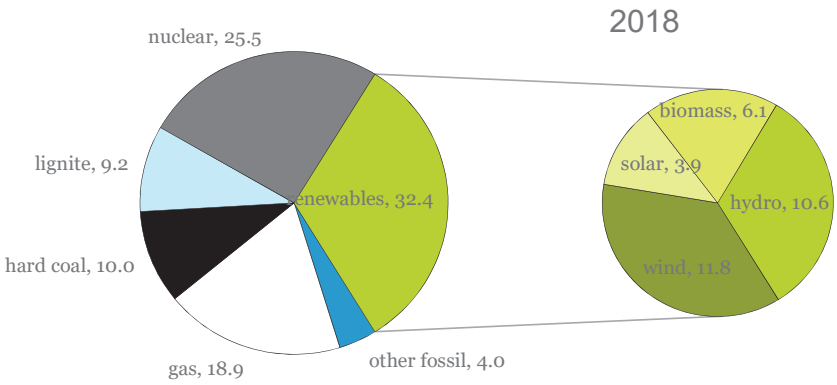
At the same time, 2017 was the first year in which non-hydro renewable energy generation (wind, solar and biomass) surpassed coal-based (hard coal and lignite) energy generation in the EU-28.

Taking the full period into account, coal generation is certainly on the retreat as Figure 1 illustrates. While the period 2010-2012 showed a strong increase in coal, there has since been a clear declining trend.

Total coal use in electricity generation in the EU-28 fell by six per cent in 2018 and was 24 per cent below 2010 levels. For hard coal, the respective falls were nine per cent and 34 per cent, while for lignite – the most polluting source of energy – the declines were a mere 2.5 per cent in 2018 and eight per cent compared to 2010 (Agora Energiewende and Sandbag 2019).

The composition of electricity generation in the EU-28 in 2018 shows that renewables provided 32.4 per cent of total electricity, followed by nuclear energy (25.5 per cent), hard coal and lignite (19.2 per cent) and gas (18.9 per cent). Renewables other than hydro made up 21.8 per cent, just above coal and gas (Figure 2).

Figure 2 **The composition of electricity generation by type of fuel, EU28, 2018 (per cent)**



Source: Eurostat, Agora Energiewende and Sandbag (2019)

More detailed data by member state is available for 2016 (Eurostat 2018). In that year, the share of solid fuel[1] in total primary energy generation reached 17.5 per cent on average across the EU-28. There are huge differences between member states, with Poland having the highest share of solid fuel with 78.4 per cent, followed by Estonia (67.3 per cent), Greece (59.1 per cent), Czechia (58.8 per cent), Bulgaria (45.3 per cent) and Germany (34.3 per cent). While 12 member states do not have coal in their energy mix at all, Germany and Poland together make up more than one-half of the use of coal in energy generation across the entire EU. In Germany, the role of coal fell by only five percentage points – from 42 per cent

1. Solid fuel is the category used by Eurostat and includes hard coal and lignite (and is used as a synonym for the two), but it also includes oil shale, a sedimentary rock containing kerogen that, in Europe, is only used in Estonia (see further in the Glossary).

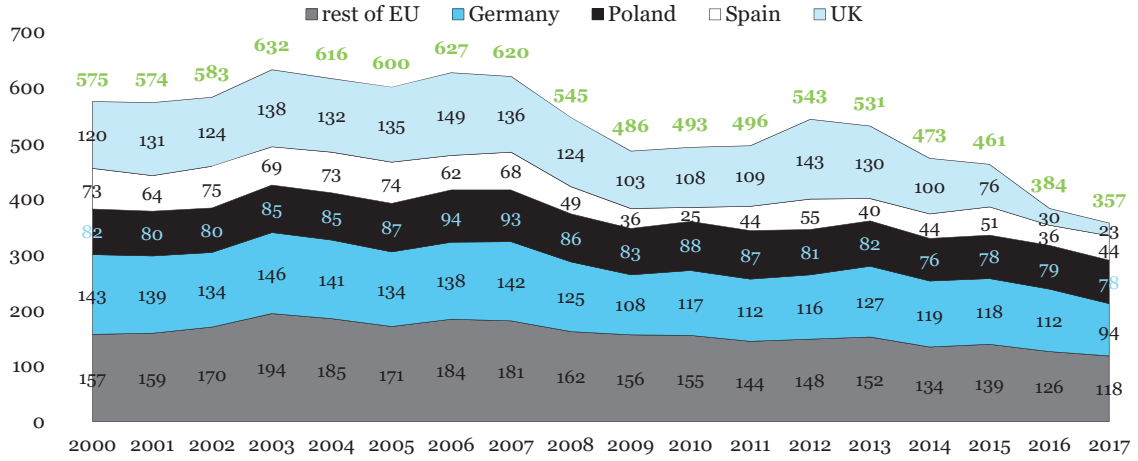
in 2010 to 37 per cent in 2017 – while in Poland there was no reduction at all in this period.

On the other hand, some member states have made significant progress in reducing the role of coal, e.g. the UK, where coal penetration fell from 28 per cent in 2010 to seven per cent in 2017, while Greece also managed a significant reduction from 54 per cent in 2010 to 34 per cent in 2017.

Reducing the role of coal in energy generation is crucial given that 66 per cent of CO_2 emissions from the power sector in 2017 were due to hard coal and lignite. This therefore means that 38 per cent of the CO_2 emissions of all sectors within the EU's Emissions Trading System (EU ETS), and 15 per cent of total EU emissions, are due to coal (Agora Energiewende and Sandbag 2018).

As regards how the role of coal has changed in those member states with the strongest usage traditions, the differences are quite significant. In order to illustrate the different patterns of change, Figure 3 (hard coal) and Figure 4 (lignite) show the role of coal in electricity generation in the EU over a longer perspective, between 2000 and 2017, indicating the trends in the top five coal-dependent member states. It is important to note that the role of coal-based energy generation in the EU still grew until 2007 and that only thereafter did it start to decrease.

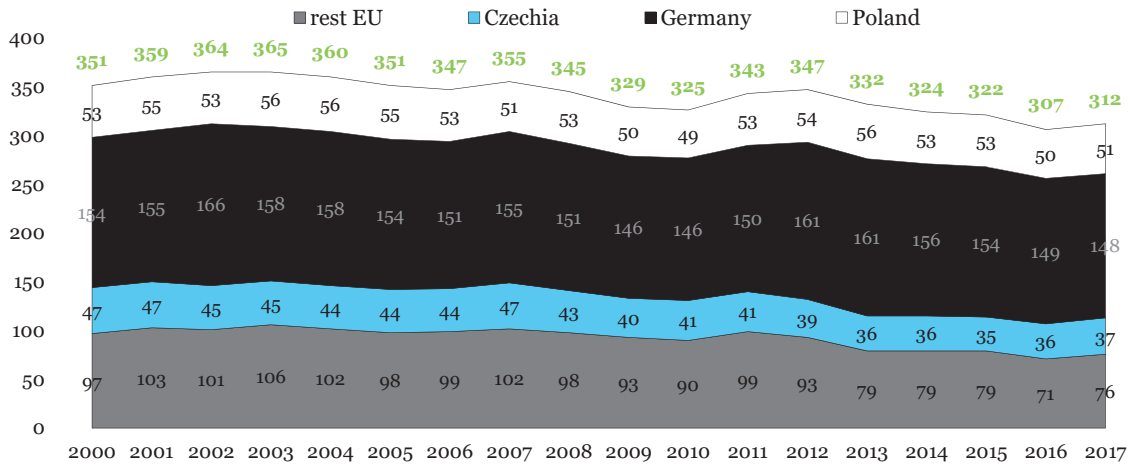
Figure 3 **The role of hard coal in electricity generation in the EU (2000-2017), TWh**



Source: Eurostat, Agora Energiewende and Sandbag 2018.

While electricity generation by hard coal fell by 38 per cent between 2000 and 2017 in the EU-28, generation by the more polluting lignite fell by only 11 per cent in this 17-year period. The data also clearly show the dominant role of a small number of member states in burning coal. In 2017, Germany, the UK, Poland and Spain made up 67 per cent of EU electricity generation from hard coal. The UK managed a spectacular reduction in the use of hard coal (by 2017 this was down by eighty per cent compared to 2000), while Spain had a forty per cent reduction and Germany 35 per cent. In Poland, however, the use of hard coal in energy generation has remained practically the same in the last 17 years.

Figure 4 **The role of lignite in electricity generation in the EU (2000-2017), TWh**



Source: Eurostat, Agora Energiewende and Sandbag 2018.

Turning to the use of lignite in electricity generation, it was Germany, Poland and Czechia that made up 76 per cent of the EU total in 2017. Most worrying is that, for the two dominant users of lignite, Germany and Poland, the use of this significant pollutant did not change significantly during the last 17 years (in Germany, it fell from 154 TWh in 2000 to 148 TWh in 2017; for Poland, the change in this period was from 53 to 51 TWh).

2. Employment

In the early 1960s, coal mining secured the employment of millions of people in Europe (the UK and western Germany had 600 thousand coal mining jobs each, while even Belgium had 175 thousand at its peak). Since then, however, the number of coal mining jobs in Europe has been in rapid and continuous decline.

Based on the most recent Eurostat data, Table 1 shows employment in coal mining (hard coal and lignite) in the last decade. In 2017, the number of coal mining jobs was just below 130,000 in the EU-27, 53 per cent fewer than in 2007 with a loss of 142,000 jobs during the decade. In 2017, almost two-thirds of European coal mining jobs were in Poland, followed by Czechia and Germany some way behind. While German coal mining jobs fell by two-thirds in the decade, in Spain almost ninety per cent of coal mining jobs were erased and the loss of jobs in Romania made up a staggering 95 per cent in that period. Poland, on the other hand, saw a reduction of forty per cent.

Table 1 **Employment in the mining of coal and lignite in the EU-27***

	2007	2017
European Union - 27 countries	271,800	129,748
Bulgaria	14,289	10,300
Czechia	24,265	15,145
Germany	42,440	14,465
Spain	8,515	923
Poland	135,905	82,036
Romania	20,908	953
United Kingdom	5,944	1,420

*EU-27: including UK, but excluding HR
Note: for UK, 2007=2008 and 2017=2016; for Czechia, 2007=2010
Source: Eurostat 2019 [sbs_na_ind_r2]

Looking at broader employment in the coal industry, the latest data available are from 2015. In that year, the number of total jobs in coal mining was 185,000.[2]

2. Employment data are based on the estimates of the JRC 2018 expert report that draws upon national information and on estimates by Euracoal (Alves Dias et al. 2018). These data are presented here in order to gain an overview of the entire coal sector (including also power plants). Consequently, the data do not exactly correspond to Eurostat data, which only refer to coal mining, and are also more recent. At the same time, even the 2015 figures from Eurostat are different to the ones presented here (185,000, in comparison to the number of jobs in coal mining as reported by Eurostat of 159,000). The biggest difference

Based on national data, it is estimated that around 52,700 people worked in coal-fired power plants across the EU (Alves Dias *et al.* 2018). Coal employment in the top ten countries is shown in Table 2. Most coal-related jobs are concentrated in the coal mining sector where Poland alone has a share of more than fifty per cent. Coal-fired power plants have fewer than one-third of mining jobs and are spread more evenly across the EU, although Poland has the highest number here, as well, followed by Germany and Czechia.

Table 2 **Number of jobs in coal power plants and coal mines (top ten member states), 2015**

	Jobs in coal power plants	Jobs in coal mines	Total
Poland	13,000	99,500	112,500
Germany	10,900	24,700	35,700
Czechia	3,600	18,000	21,600
Romania	3,600	15,000	18,600
Bulgaria	2,700	11,800	14,500
Spain	3,300	3,400	6,700
Greece	1,600	4,900	6,500
United Kingdom	4,100	2,000	6,100
Slovakia	500	2,200	2,700
Italy	2,400	300	2,700
Rest of EU28	7,000	4,000	11,000
Total EU28	52,700	185,000	237,700

Source: Alves Dias *et al.* 2018

Almost three-quarters of the total number of 237,700 direct coal-related jobs in 2015 were concentrated in ten EU NUTS-2 regions, four of which are located in Poland, two in Germany and two in Czechia. Poland had 26 coal mines in operation, 21 of which were hard coal and five lignite. Most jobs were in hard coal, with a total of 91,600, 82,700 of which were in Silesia. Lignite mining had 8,900 jobs, 4,900 of which were in the Lodzkie region.

Throughout the coal value chain, the number of indirect jobs dependent on coal activities is estimated to reach 215,000. Based on estimates by Euracoal, the umbrella organisation of the European coal industry, the number of indirect jobs in the coal supply chain (based on 2015 data) were highest in Poland, with around 88,000 employees, followed by Germany (34,000), Czechia (19,000) and Bulgaria (15,000) (Alves Dias *et al.* 2018).

Based on these estimates, total coal-dependent jobs across the EU amounted to just over 450,000 in 2015. Given that direct coal mining jobs were, by 2017, already down by 25 per cent compared to 2015, one can assume that the total number of coal-dependent jobs may also have decreased to a similar extent. It can also be expected that many of these jobs will become redundant in the next decade, both in

between the two sources appears in the case of Romania.

direct and indirect coal activities. In comparison, Eurostat data also reveal that the total number of people employed in the EU27[3] was 215.0 million in 2007, falling to 209.4 million during the crisis (2013), but then, overcoming the losses, growing to 219.8 million by 2017. During the entire period the number of manufacturing jobs fell from 32.0 million to 28.5 million. Although the total number of coal-dependent jobs makes up only a small fraction of European employment, and job losses in manufacturing and mining were more than compensated by job creation in other sectors, the challenge is that these are concentrated in a small number of regions with wide-ranging effects on the local and regional economy.

3. Including UK but excluding Croatia, for the 15-64 age group.

3. The main drivers and effects of the coal transition

The vast majority of coal-fired plants in Europe were commissioned more than thirty years ago. These plants are, on average, 35 years old with an estimated efficiency[4] of a mere 35 per cent, much below the average level in electricity generation. The efficiency of most coal-fired plants in Europe is within a range of 30-37 per cent (lowest: western Slovakia, with 15 per cent and an average age of 53 years, and Peloponnessos in Greece, with 25 per cent and 33 years; highest: Groningen with forty per cent and one year old, and Castilla La Mancha with 42 per cent and 19 years) (Alves Dias *et al.* 2018). Gas plants and wind energy have significantly higher efficiency levels while solar energy has lower. For renewables, efficiency does not pose a challenge as there are no extra costs, emissions or pollution attached to the waste of wind or solar power (see further in the Glossary).

Stricter regulation on emissions and changing profitability patterns due to technological progress making renewables cheaper, as well as a turn of investment decisions away from coal, mark the stages of coal's retreat and will lead to the closure of mines and power plants with substantial employment losses in the near future.

3.1 Stricter emissions regulation

At a time when Europe needs radically to step up its climate policy efforts to meet the COP21 objectives, and when coal is responsible for two-thirds of the CO_2 emissions of the power sector, coal-fired power plants are facing growing regulatory pressures to reduce greenhouse gas emissions and air pollution.

In the adoption of its 'Best Available Technique (BAT)' conclusions for Large Combustion Plants (LCP) in 2017, the European Commission (2017) has set new standards for these plants in accordance with the Industrial Emissions Directive (IED). These limits will be the new point of reference for permitting large thermal power plants in Europe on the basis of the 'best available techniques reference document' (BREF). BREF sets, among other things, new upper limits for the emission of oxides of nitrogen and sulphur (NOX and SOX) by large installations burning carbon-based fuels like coal and lignite. All coal-fired power plants in the EU need to meet these standards by 2021 but, in 2017, 82 per cent of such installations exceeded them (Wynn and Coghe 2017). This includes eighty per cent of German and virtually all Polish coal power plants. The stricter limits of the revised BREF will replace the 2016 standards set down under the Industrial Emissions Directive. Under the still-prevailing round of IED-based emissions controls, power plants had the choice either to meet the emissions norms, delay full implementation until June 2020 under so-called transitional national plans, or 'opt out' and close by 2023.

4. See further in the Glossary.

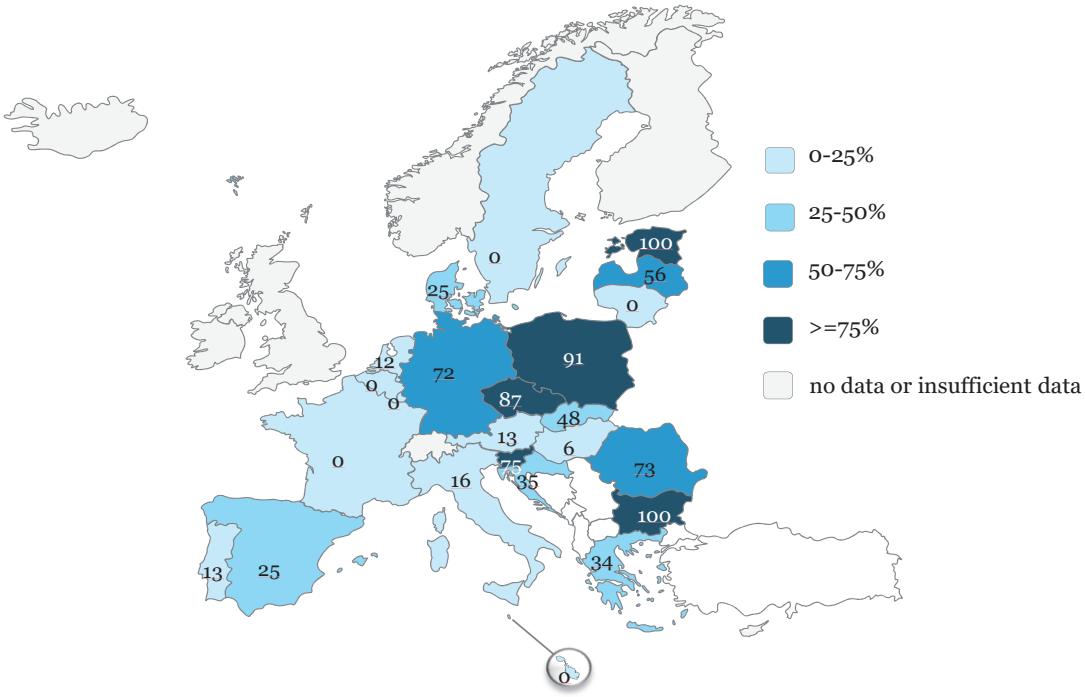
The estimated costs for the corresponding upgrade of these coal power plants could be between €8-14.5 bn for the EU: €2.4-4.3 bn for Poland and €0.7-1.2 bn for Germany (Climate Analytics 2018). In addition, the operating costs of these plants where more effective filters were fitted would also increase.

As part of the package of 'Clean energy for all Europeans' (European Commission 2016), the Commission's 2018 proposal for a recast of the Electricity Regulation is another crucial regulatory initiative affecting the lifespan of coal-fired power plants. The proposal sets stricter principles for national capacity mechanisms, i.e. the subsidies paid by several EU member states to power plants for making available stand-by power generation capacity to meet demand peaks. Such mechanisms must conform to EU guidelines on state aid for environmental protection and energy. Under the proposed Emission Performance Standard (of 550g CO_2 per kilowatt hour (kWh)), the European Commission seeks to limit state aid for power plants to those that emit less than 550g CO_2 per kWh of electricity. Such a threshold would apply to existing plants from 2025 and for new plants from as soon as the regulation enters into force.

The proposed emissions limit met stiff resistance from a number of member states, led by Poland, but it has been kept on the agenda of both the European Parliament and the EU Council (Simon and Hodgson 2018). In January 2019, EU member state ambassadors approved an agreement with the European Parliament clearing the way for final adoption. The compromise (known as the Polish clause), made in order to end Polish resistance, was to allow state aid for new power plants until the end of 2019. The final vote in the European Parliament is expected in the first half of 2019, followed later in the Council (European Council 2019).

The possible effects of the new Electricity Regulation would be sizable for coal-fired power plants (and for those fuelled by oil shale in Estonia), as Figure 5 shows. Calculations by Eurelectric (2017) reckon that 24 per cent of power capacity in western Europe (72 per cent in Germany) and 41 per cent in CEE member states (Poland 91 per cent, Estonia and Bulgaria 100 per cent) would become ineligible for capacity payments.

Figure 5 **Share of power plant capacity to become ineligible for capacity reward (public subsidy) from 2025 by member state according to the 2019 Electricity Regulation (%)**



Source: Eurelectric (2017)

Facing such requirements and the corresponding need for substantial investment in pollution reduction, amid increasing competition from renewables, many operators may decide either to cut back dramatically on the originally-planned running times for their power plants or otherwise shut them down entirely.

Utilities could try to make efforts to extend plant running time by investing in NOX and SOX abatement. Carbon capture and storage (CCS, see further in the Glossary) could theoretically facilitate the continuity of operation of retrofitted coal plants when certain conditions are met, among others where the technology proves to be commercially viable and meets public and political acceptance. Under the CCS Directive, member states have to ensure that power plant operators (above an output of 300 megawatts (MW)) have assessed the availability of suitable storage sites, the economic and technical feasibility of transport facilities and whether the conditions for retrofitting for CO_2 capture are met (European Commission 2009).

Preliminary expert estimates indicate, however, that only 13 per cent of existing European capacity can be retrofitted with CCS technology (Alves Dias *et al.* 2018). The use of CCS technology in energy-intensive industries (steel, chemicals and cement) is seen as indispensable in achieving a net zero carbon economy by 2050, but in the power sector it may play a transitory role only. A special report by the European Court of Auditors concluded that the use of CCS in power generation had failed to achieve meaningful deployment, with not one CCS project being successful in receiving funding under the European Energy Programme for

Recovery (EEPR) or the first phase of NER300.[5] This has left CCS projects largely unfunded by the EU (ECA 2018) and, overall, 21 CCS power plant projects in the EU have either been cancelled or put on hold. The single CCS project receiving funding, the UK's Whiterose Project, was again thrust into uncertainty when, in 2015, the UK government withdrew its own CCS funding. In 2017 the contribution of power plants with CCS to global electricity generation was 0.0 per cent (IEA 2018). Targeted policy support for CCS has also diminished as electricity prices have fallen while scale build-outs of wind and solar capacity have demonstrated the promise of renewables as a low-carbon generating option (Caldecott *et al.* 2017b).

Investing in the extension of the lifecycle of coal-fuelled power plants is a risky strategy, especially in the case of older and more polluting plants. All European fossil fuel-based utilities will have to make urgent investment decisions, given the risk inherent in adopting a wait-and-see approach.

3.2 Renewables becoming more competitive

Phasing out coal is also looking increasingly feasible and economically affordable in large parts of the world. Renewable energy sources, such as onshore and offshore wind and solar photovoltaics (PV), are constantly improving in terms of cost competitiveness with coal. The cost of renewables is plunging faster than forecasters anticipated even a few years ago, with technologies such as large wind turbines appearing on the market. Bloomberg New Energy Finance (BNEF) predicts two 'tipping points' where the cost of renewables will make power generation fuelled by natural gas and coal increasingly unattractive. PV and wind are already cheaper than building new large-scale coal and gas plants. The next tipping point could come by the mid-2020s, when the operation of existing coal and gas plants could become more costly than taking power from wind and solar. Compared to 2017 levels, the cost of an average PV plant is estimated to fall 71 per cent by 2050. Wind energy is also getting cheaper and BNEF expects the cost to drop 58 per cent by 2050 (BNEF 2018).

At the same time, investor expectations are also changing fast with many investment funds starting to divest from fossil fuel energy, and from coal in particular, primarily because of economic considerations but also ethical ones. A senior London commodity hedge fund manager is forecasting that, with rising carbon prices, coal demand in Europe will collapse within a few years, forcing power stations to close across the continent (Sheppard 2019). Glencore, the world's top coal exporter, has announced that it will cap its production of thermal and coking coal at about the current level of 150m tonnes per year and has ruled out a further expansion of its coal business with a view to the goals of the Paris climate change agreement (Hume *et al.* 2019). Rio Tinto has become the first big mining company to leave the coal industry after agreeing in 2018 to sell its last asset, an Indonesian coal company, as many banks and asset managers are refusing to invest in the commodity (Hume 2018).

5. In 2009, the EU created the New Entrants' Reserve 300 (NER300), funded by the sale of 300 million emission allowances (€2.1 billion) to support CCS and innovative renewable energy projects (see further in the Glossary).

Litigation practices on climate change and pollution have also contributed to a rising risk for coal projects. The latest example is that investors have lost a court appeal to build a coal mine in Australia's Hunter Valley on the grounds of its environmental impact based on evidence from a climate scientist: 'In a landmark ruling, an Australian court barred a new coal mine project citing an increase in greenhouse gas emissions, as well as uncertain economic benefits and adverse social and visual impacts' (Burton 2019).

3.3 Employment transitions

Up to the most recent times, climate policies (such as carbon price or emissions standards) have had a limited impact on jobs and what impact there has been has also been dwarfed by the millions of jobs lost during the economic crisis. As mentioned in section 2, between 2007 and 2017 3.5 million manufacturing jobs were lost in the EU27, while the overall number of jobs grew by 4.8 million. Beyond the cyclical effects, these trends show a clear structural shift the drivers of which are hard to identify. The magnitude of these changes, however, exceeds by far the numbers we are talking about in the coal sector.

Most of the employment losses in coal mining in the past decades were due to economic reasons (e.g. due to increasing extraction costs and to cheap imports of hard coal) and industrial restructuring, and were not directly connected to sustainability policies. The impact of mitigation policies will certainly rise as countries implement national energy and climate plans in order to reach the objective of a net zero carbon economy by the middle of the century. These policies will need to be much more ambitious than they were in the past and will consequently also have harsher employment effects.

While the magnitude of the job losses stemming from a phasing-out of coal may not be critical at a whole economy level, the regional and local effects can be significant. There are several regions in Europe in which the livelihood of a large part of the population is dependent on a coal-based economy. These regions will need comprehensive regional development plans as part of targeted just transition strategies (see country profiles and case study examples later in this working paper).

Our overview of current and past employment in the coal sector in section 2 showed that the number of direct coal industry-related jobs (in coal mines and in power plants) in 2015 was c. 237,000 in the EU-28. Based on Euracoal estimates of indirect coal-related jobs, total employment in the broader coal industry could have been just over 450,000 in 2015. Matched with Eurostat data on coal mining jobs from 2017 and information on plant closures, direct coal-related jobs in 2017 could have been around 170,000 with total coal-related employment standing just above 300,000. With the regional concentration of jobs, a small number of regions are expected to be hit hard by the transition. According to the Commission's expert report (Alves Dias *et al.* 2018), one region in Poland may lose up to 41,000 jobs and a further three (in Czechia and Bulgaria) each look likely to lose more than 10,000 jobs.

Several coal mines in the recent past have been closed due to a lack of competitiveness (27 mines in the 2014-2017 period, including mines in Germany, Poland, Czechia and Romania). Spain has closed its last 26 coal mines due to losses and the end of public subsidies, sustaining in 2018 a loss of 2,000 jobs that ended the coal mining era in that country. In 2018, Germany completed its phase-out of hard coal mining although the mining of lignite still continues.

Experts from the JRC research centre (Alves Dias *et al.* 2018) have forecast cumulative job losses of c. 27,000 in coal mining and the power sector by 2020. In the next decade, the closure of coal mines will be mainly aligned with the decommissioning rates of coal-fired power plants. With a view to the stricter regulations on emissions and state aid, and considering also their age and technological level, 35 per cent of Europe's coal-fired plants will face a first wave of retirements between 2020 and 2025, with an estimated direct job loss in power plants of up to 15,000. Related job losses in coal mining could reach a further 35,000 in that period. A second decommissioning wave between 2025 and 2030 could cause the loss of another 18,000 jobs in power plants and over 35,000 in coal mining. Altogether, 130-140,000 direct jobs could be lost by 2030, leaving only a few tens of thousands in the entire EU. Energy-intensive industries that rely on coal-based energy inputs might also be affected. For example, coking coal is a critical input for the European iron and steel sector as it covers 37 per cent of its raw material needs.

The emerging low-carbon economy is expected to compensate for the unavoidable job losses in carbon-intensive activities at the level of the whole economy, but these jobs will not necessarily appear at the same time and in the same place where jobs are being lost.

Tackling these structural mismatches should be one of the aims of properly-designed just transition policies to balance the burdens of the necessary transformation. This is why appropriate and specific 'just transition' policies tailored to coal-intensive regions will become crucial in facing these challenges.

4. An overview of national coal phase-out plans

The governance mechanism of the Energy Union and Climate Action initiative (European Commission 2018b) obliges member states to come up with national energy and climate plans. Specific plans for 2030 must quantify planned national contributions towards achieving the EU's 2030 targets on renewable energy and energy efficiency. These plans will deal with the future composition of energy generation and the lifespan of existing coal-fired power plants.

During 2016 and 2017, coal plants with a capacity of 14 GW were closed in the EU while the intended retirement of a further 7 GW of coal plants has been announced. A total of 39.6 GW of coal-fired power capacity, corresponding to 25 per cent of the EU's currently operational coal fleet, is located in member states where national governments have announced coal phase-out plans (Climate Action Tracker 2017).

Western Europe may be phasing out coal, but most CEE new member states – led by Poland – are sticking to it. The exceptions here are Latvia and Lithuania, which are coal free, while Hungary and Slovakia have limited dependence on coal and a realistic perspective of phasing it out by 2030. Estonia, on the other hand, is keen to continue to operate its oil shale power plants that have the highest carbon intensity in the whole EU. Estonia generates 35 times the EU average in hazardous waste per capita, 98 per cent of which comes from oil shale combustion and refining, while more than ninety per cent of Estonia's CO_2 emissions come from burning oil shale. The OECD has stated that 'Reducing its dependence on oil shale is Estonia's number one economic, environmental and social challenge.' (OECD 2017)

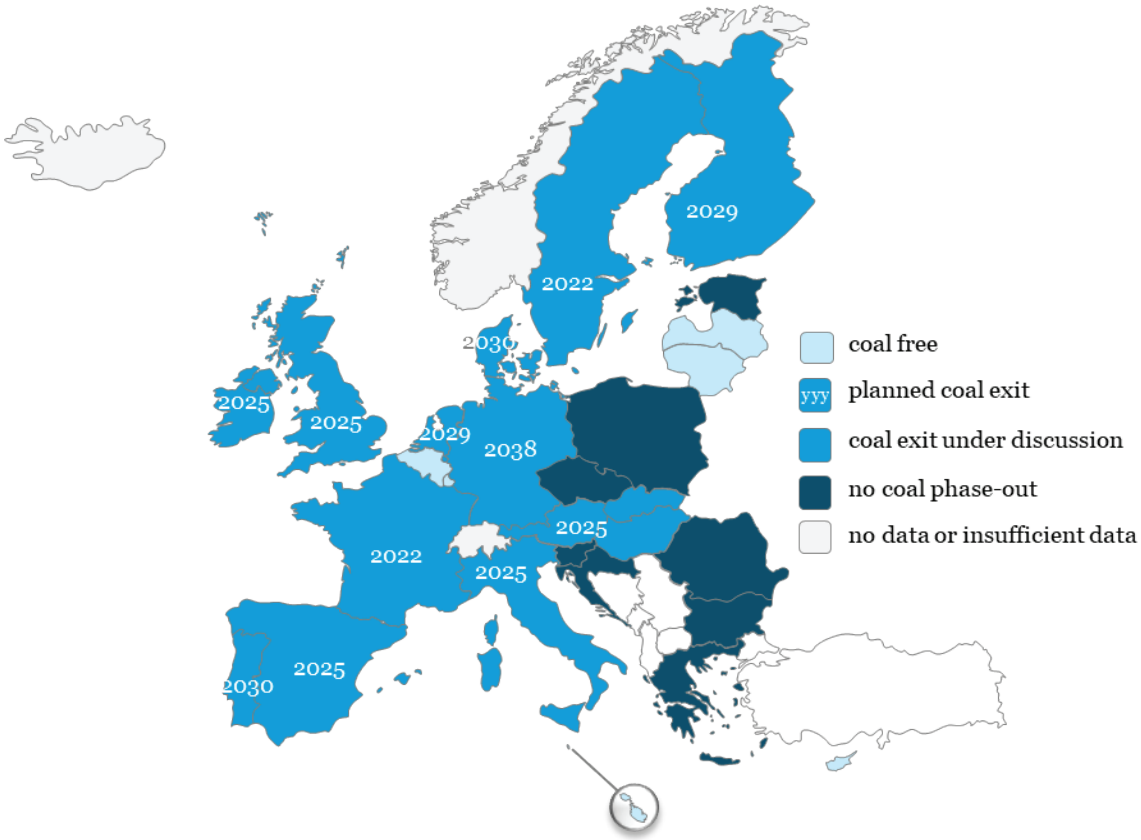
All EU-15 member states other than Greece are planning to phase out coal by 2030 at the latest, with Germany having announced a later phase-out of coal by 2038. These 'phase-out countries' have been responsible for almost all of the fall in hard coal generation in the last decade.

In November 2017, the UK and Canada initiated the Powering Past Coal Alliance,[6] in which governments, regions and a number of companies have committed to phasing out existing traditional coal power in line with the Paris Climate Agreement. This means a commitment by OECD and EU member states for a coal phase-out by 2030 and by no later than 2050 in the rest of the world. Fourteen EU member states have signed up to the Alliance: Austria; Belgium; Denmark; Finland; France; United Kingdom; Ireland; Italy; Latvia; Liechtenstein; Luxembourg; Netherlands; Portugal; and Sweden.

6. https://poweringpastcoal.org/about/Powering_Past_Coal_Alliance_Members.

Figure 6 sums up the available information on the status of the phasing-out of coal by EU member state.

Figure 6 **The status of coal phase-out in the EU (as of December 2018)**



Note: Cyprus, Belgium, Latvia, Lithuania, Luxembourg and Malta have no coal-fired plants.
Source: Europe Beyond Coal (2018) and national sources

Bulgaria, Croatia, Czechia, Greece, Poland, Romania and Slovenia have no coal phase-out plans and none even has any ongoing discussions. Estonia has no discussion and no phase-out plan for its heavily polluting oil shale power plants. Meanwhile, Poland is setting its future on coal: the current government has no plans to phase out coal – quite the contrary, Poland's draft energy plan from November 2018 projects that coal (hard coal and lignite) will still account for sixty per cent of electricity generation by 2030, from 77 per cent in 2018. In 2017, Poland commissioned a brand new 1 GW coal-fired plant and has a further five units under construction projected to come online between 2018 and 2020 with a total capacity of around 3.5 GW. By 2017, coal-based generation in Poland had not fallen since 2000. The Polish government was also attempting to block the approval of the Emission Performance Standard proposed by the Commission under the Clean Energy package, the result of which is that new coal plants are still eligible for state aid until the end of 2019. Polish power plants are trying to secure as many contracts for establishing capacity mechanisms as they can before the deadline.

4.1 Coal phase-out status of member states (as of December 2018)

We provide below an overview of coal phase-out plans by member states based on the available literature (Europe Beyond Coal 2018 and national sources, as indicated).

Austria - 2025

The Austrian government has announced coal phase-out by 2025, but is considering the option of an earlier exit by 2020. The companies that operate the last two coal plants will close them by 2018/2019 and 2025, respectively.

Belgium - 2016

Belgium is the first, and up to now the only, formerly coal-burning EU member to have become coal power-free. The last coal-fired plant closed in March 2016. The Belgian government has also made a commitment to phase-out nuclear power by 2025 and to fill the power gap by stepping up renewables and installing gas-fired power plants (Morgan 2018).

Denmark - 2030

The Danish government has signed up to the Powering Past Coal Alliance and has declared a phasing-out of coal by 2030.

Finland - 2029

In October 2018, the Finnish government presented a legislative proposal to parliament to ban the use of coal in power generation after 1 May 2029. The government has also agreed to establish a €90 million fund for energy companies that opt to end the burning of coal by 2025.

France - 2022

The role of coal-based energy generation in France is very limited due also to the high share of nuclear energy. The country was already committed to a phasing-out of coal by 2023 under the Holland Presidency, but President Macron has brought this forward to 2022, albeit no specific measures have yet been proposed. The issue of just transition will be addressed by the introduction of a 'transition contract' with affected regions.

Germany - 2038

With 48 GW of coal capacity, Germany is second largest in the EU, right after Poland. Coal phase-out is also hampered by the radical phasing-out of nuclear energy and the time-consuming development of a new electricity distribution network. The government has established a multi-stakeholder Commission on the coal industry, tasked with finding an agreement on phasing out coal. In early 2019, an agreement was reached, with an end date of 2038, concerning a range of measures as regards compensatory payments to power plants, a regional development concept for affected regions and just transition measures for affected workers (Schultz and Traufetter 2019).

Hungary - (possibly) 2030

There is no official government policy or commitment, but the last remaining lignite power plant has expressed that a 2030 exit from coal is its most likely future scenario in the 'Coal Regions in Transition Platform' established by the European Commission. Beside Slovakia, Hungary could be among the first CEE new member states to phase out coal by 2030.

Ireland - 2025

Ireland joined the Powering Past Coal Alliance in 2018 and the government has announced an end to the use of coal in power generation by 2025. In July 2018, the Irish parliament passed a bill to sell the country's investments in fossil fuel (coal, peat, oil and gas), making Ireland the first country in the world to divest from all fossil fuels.

Italy - 2025

In October 2017, the Italian government announced a phase-out of coal by 2025 as part of its National Energy Strategy. Although the Strategy was signed at the end of 2017, it is non-binding. At the same time, Enel, its largest energy utility, has announced its 'Futur-e Plan' including an ambitious decommissioning plan for its coal-fired power plants.

Netherlands - 2029

The phasing-out of coal by the end of 2029 was announced in October 2017 and, in May 2018, the Dutch government introduced a legal ban on electricity production based on coal from 1 January 2030. Three of the five remaining coal-fired power plants in the country only entered operation in 2015 and 2016, so they will operate for less than half their expected lifetime.

Portugal - 2030

In November 2016, the Portuguese environment minister confirmed that power plants in the country would stop burning coal before 2030. This was reaffirmed in October 2017 with the launch of Portugal's roadmap to 2050 carbon neutrality.

Spain - 2025

Spain has great potential for renewable energy generation and has overcapacities in its existing coal plants. Spain will close nine coal-fired plants (5.5 GW) by June 2020 as they are due for retirement in line with EU pollution legislation. The responsible minister also confirmed that all coal-fired plants would close by 2025 as the country turns to gas-fired electricity generation (Bronte 2018). The government has been working on a new climate law and on Spain's climate and energy plan with a likely phasing-out of coal by 2025.

Sweden - 2022

The last coal plant in Sweden will close by 2022 and the country has the ambition of becoming the first industrialised country without fossil fuel energy.

United Kingdom - 2025

Coal phase-out has been announced by 2025. In 2018, the UK government confirmed its intended regulatory approach although a legislative framework is still missing.

Slovakia - phase-out under discussion

Slovakia has relatively low coal-fired power plant capacity with, in 2016, just 7.3 per cent of its electricity production being generated by coal (for the EU-28 this was 17.5 per cent). In 2017, the Slovakian Environment Minister declared 2023 as the target year for Slovakia's coal phase-out, both in mining and in power generation, but no official government position has yet been formulated.

5. Just coal transition in theory and practice

These trends show that coal mining and coal-based energy generation is under substantial pressure and that such pressure is likely only to increase over the next decades. Phasing out coal is widely seen as a 'low hanging fruit' in decarbonisation efforts to fulfil climate policy commitments and to make progress towards a net zero carbon economy by 2050. Coal-based energy generation and use make up a significant share of greenhouse gas emissions (15 per cent of total EU emissions) but, at the same time, coal has a rather low share in the total economy and, with direct employment of c. 170,000 jobs in the EU28 by 2017 (with indirect jobs estimated to rise just above 300,000), also a low weight in terms of EU total employment. On the other hand, coal-dependent activities are concentrated in a small number of European regions. If properly-designed just transition policies can have a meaningful effect, then the coal transition is the right place to start.

However, this transformation comes with important challenges and risks. Most immediately, the consequences are to be borne by workers, companies and regions (most of which are structurally weak), each being dependent in different ways on the economic activity generated by coal mining. Workers face risks related to finding desirable re-employment or, for some, managing their exit from the labour force; companies face reputational, financial and strategic risks; while regions will often have to adjust to the loss of a significant share of local economic activity in local communities. The way that these risks are managed is vital to ensuring the best possible outcomes for all. Given the importance of the issues at stake, it is imperative that they are addressed fairly and effectively. Moreover, from a political perspective, these local challenges, if not addressed well, can also take on a global dimension: they can also have potential feedback effects on the willingness of populations and their governments to undertake the necessary action to phase out the use of unabated coal (Caldecott *et al*. 2017a) and pursue a progressive climate policy more broadly.

5.1 The just transition concept

This all means that implementing a 'just transition' is the key to tackling these challenges; one might also add that it is indispensable for making decarbonisation a success and, furthermore, where else if not the coal industry? However, what might a just coal transition look like in practice?

Just transition has long been a trade union demand and it was due to the pressure of trade unions that just transition became a mainstream concept at the UNFCCC

negotiations on climate change and at the level of the major international institutions (Galgóczi 2018). Trade union organisations, such as the ETUC, have called on parties to incorporate just transition into their national energy and climate plans (ETUC 2017). The ETUC has also stressed that an adequate labour chapter is crucial to making decarbonisation socially acceptable just as much as it is crucial in attaining climate targets, and points to the key role of the social partners throughout the process. It was a major success for trade unions that just transition was included in the Preamble to the 2015 Paris climate agreement (UNFCCC 2015) and that the 'Silesia Declaration on Solidarity and Just Transition' was adopted at COP 24 (ETUC 2018).

The ILO Guidelines on just transition (ILO 2015) highlight the need to secure the livelihoods of those who might be negatively affected by the green transformation and also stress that the emerging low carbon economy should be inclusive and based on decent work and lower inequality. The main approach is that sustainable development is only possible with the active engagement of the world of work. Employers and workers are not passive bystanders but agents of change able to develop new pathways to sustainability. The ILO Guidelines set the basic principles with two fundamental pillars: having a clear future strategy and a comprehensive policy framework on the one hand; and, on the other, instituting a meaningful and functioning social dialogue throughout the entire process and at all levels.

Just transition should be an integral part of decarbonisation and it is indispensable in making a success of it. Just transition has several dimensions and its context and practical implications differ from country to country, so a one-size-fits-all approach will not work.

The idea of just transition should not be as an 'add-on' to climate policy; it needs to be an integral part of a sustainable development policy framework. The main aim is to protect workers and communities from the most adverse effects of decarbonisation policies; therefore, meaningful social dialogue at all levels of the transformation is vital. Unions need to be proactive in managing all the stages of just transition. Recognising that defensive strategies to preserve a given status quo will not work, they need to formulate and drive the agenda themselves if just transition goals are to be achieved, while alliances with civil society organisations, NGOs and environmental justice organisations are also necessary.

A coherent strategy with clear objectives and targets is essential but can only work properly if supported by the main stakeholders. For trade unions and environmental justice groups, it makes a difference whether they face a hostile political background or a co-operative one.

The time frame of the transition is also crucial: in general, a longer time frame is necessary for a balanced transition. While we no longer have fifty or sixty years for a transition (as was the case in the Ruhr – see section 6), 10-12 years seems to constitute a realistic framework for a comprehensive reconversion roadmap which would also allow time to build well-founded just transition plans. This is particularly important for investment decisions and skills development. Short notice and *fait accompli* situations are poor and must be avoided.

5.2 How could just transition work during the coal phase-out process?

Just transition is a broad concept with several dimensions. Formulating concrete strategies can only be successful where these are matched to the local, economic, social, institutional and political contexts.

It makes a great deal of difference if the respective government is proactive and provides resources to facilitate the transition. Equally important is whether the specific restructuring process is directly linked to government policy and regulatory measures with government responsibility or whether it arises due to an economic reason and, therefore, is only indirectly linked to regulatory changes and policy objectives. Is the decision on closure coming from the government, regional authorities or from the owners of a private enterprise? Who are the main actors and how are they involved in the decision-making process?

In principle, the just transition concept addresses three types of challenge. One is the distributional effects of climate change mitigation policies, while a second is made up of the effects on employment and related employment transitions. The third important aspect is the future of the local and regional economy (beyond the specific workplaces affected by the restructuring measures).

From a functional perspective, just transition has two main dimensions: 'outcome' (the new employment and social landscape in a decarbonised economy); and 'process' (how we get there). The outcome should be a sustainable regional economy that has a long-term perspective with decent jobs and reduced inequality. Meanwhile, the process should be based on a managed transition with meaningful social dialogue at all levels to ensure that burden-sharing is fair and that nobody is left behind.

5.3 The role of the EU in promoting just transition in the phasing-out of coal

Decarbonisation of the economy is a collective challenge for the EU as a whole and the process will unavoidably create winners and losers. Those European regions that depend on coal mining and coal-based energy generation will be among the losers. It is therefore necessary that the phasing-out of coal mining and use should be supported from the European level based on the principle of European solidarity but also in making sure that the deep decarbonisation goals of the EU become achievable despite the potential for resistance in the coal regions affected by them.

The Coal Regions in Transition Initiative launched by the European Commission (2018c) is designed to help regions manage the challenges of energy transition as coal-dependent regions establish new economic fundamentals beyond coal. The platform brings together the EU, national, regional and local stakeholders

involved in the transition to create partnerships and facilitate information exchange. It aims to help with the development of projects and long-term strategies for coal regions to launch and manage decarbonisation initiatives and respond to the environmental and social challenges. The platform also contributes to the formulation of just transition strategies tailored to regional specifics by bringing greater focus on social fairness, better jobs, new skills, structural transformation and financing for the real economy.

Once local and national authorities have made their decisions, a number of existing EU funds and tools are available to support the transition. Available funds include those of EU cohesion policy, such as the European Structural and Investment Funds (ESIF), the Cohesion Fund (CF), the European Social Fund (ESF) and the European Regional Development Fund (ERDF). These funds are able to support projects aimed at infrastructure development, the transition to a low carbon economy and environmental protection and resource efficiency. The EU's Cohesion policy helps regions achieve economic transformation by building on their 'smart specialisation' assets, i.e. their competitive strengths, with the aim of fostering innovation and decarbonisation.

The EU's LIFE Fund can support projects which reflect EU environmental legislation (e.g. in improving air quality or the remediation or ecological restoration of old mining sites and degraded land).

The Modernisation Fund of the EU Emissions Trading System provides support for cleaning up the energy system and can be used to support employment transition and reskilling.

The European Investment Bank (EIB) and the European Institute of Innovation and Technology (EIT) support the development of new, clean energy technologies. EIT InnoEnergy, for example, works with business and with research and education organisations on innovation projects, business creation and acceleration.

The Coal Regions in Transition Initiative can certainly contribute to the provision of practical advice and technical assistance to regional actors on coping with the challenge of re-inventing their regions in a post-carbon world. It is therefore welcome that a dedicated Secretariat for the Coal Regions in Transition Initiative will be established in 2019 and will provide toolkits and guidelines as well as technical assistance to coal and carbon-intensive regions across the EU for the development and implementation of transition strategies and related projects. By the end of 2018, the Coal Regions in Transition Initiative had provided targeted assistance to 13 pilot regions in seven member states (Czechia, Germany, Greece, Poland, Romania, Slovakia and Spain). With the plethora of available EU funds, it would, however, be helpful for regional actors to designate a special fund tailored to the challenges posed by the phasing-out of coal. Together with specific technical assistance and the planned toolkits and guidelines, this could make a real contribution.

For the five European Structural and Investment Funds (the ESI Funds), €454 bn has been allocated during the current budgeting period, i.e. 2014-2020. For some European member states, investments through the ESI Funds represent a significant share of total public investment.

A study by the Wuppertal Institute (Wehnert *et al.* 2017) examined ESI co-financing for projects under the category 'Adaptation of workers, enterprises and entrepreneurs to change' in four European coal regions. By the middle of the 2014-2020 budget period, 27 per cent of the ESI co-financing allocated to projects in the Polish region of Silesia had an impact on coal transition. However, the study also found that, while a total value of €236.66m had been allocated to projects established within the overall category of 'employment transitions', the dedicated part of this provided specifically to mining companies and their employees to deal with restructuring was a mere €3.9m, which can be seen as marginal relative to the overall portfolio. Furthermore, the €3.9m allocated to the 16 projects under the heading of facilitating coal transition was still lower than the €4.3m that has been identified as project funding that actually reinforces structural dependencies on coal in the region.

Apart from Silesia, no other examined coal region received ESI funding that would support or reinforce coal dependence.

Climate mitigation (and adaptation) is an existing priority in ESI funding, but this objective is mainly underpinned with support for renewables and energy efficiency. It is not yet generally mainstreamed in the sense of supporting the transition towards a carbon neutral economy and there are no dedicated priorities regarding coal transition and, in particular, just coal transition. This might change in the future as proposals in the Coal Transition Initiative also suggest. Furthermore, the ETUC is calling for a fund established out of revenues from the auction of emission quotas within the EU Emissions Trading System and for developing a 2050 roadmap to deal with the social dimension of decarbonisation. In its position on the Multiannual Financial Framework 2021-2027, the European Parliament (2018) indeed proposed the establishment of a just energy transition fund, made up of €4.8 bn across the whole period.

So, what does this mean for identifying the specific features of the just transition concept that are most relevant for coal transition? There are two elements of just transition that are particularly relevant: employment transition; and regional development.

In coal transition, dealing with the employment effects of mine and plant closures and facilitating job transitions are key. Another decisive issue is the future of the regional economy in terms of putting former coal regions on a sustainable basis for the future.

In the next section, an overview of a number of past coal transition cases will deliver further lessons.

6. Lessons drawn from earlier coal transitions and mine closure practices

In this section, three different cases of the phasing-out of coal are shown to illustrate how 'just transition' strategies might work in different economic, political and institutional settings.

6.1 Ruhr, Germany - decades of phasing out hard coal mining

Although the peak of coal and steel in the Ruhr had been reached by the end of the 1950s, policies continued to support the existence of these traditional industries until the 1970s. Hospers (2004) identified this as a 'lock-in' situation having three dimensions: economic; institutional; and cognitive. The economic lock-in was a result of the Ruhr's mono-structure. The institutional lock-in meant that a self-sustaining coalition of employers, politicians and trade unions had shared interests in preserving existing structures. The cognitive lock-in stemmed from local parties' overly-optimistic refusal to accept that the region's crisis was of a structural rather than a cyclical nature (Galgóczi 2014).

This phase of the structural development of the Ruhr can be seen as a warning for regions that fail to recognise the necessity of change but concentrate their efforts on preserving the status quo.

A key feature of the Ruhr transition was how employment change was managed and this provides valuable lessons for all future coal transitions. Employment in hard coal mining in the area had been radically downsized, from 473,000 in 1957 to 11,448 by the end of 2013 and then to zero by the end of 2018. Facing up to the challenges posed by a restructuring process of such magnitude required a targeted and coordinated set of statutory, collective bargaining and contractual regulations and initiatives with active contributions from the social partners.

It was in 1993 when the bargaining parties signed a comprehensive agreement guaranteeing a socially-responsible approach to the restructuring programme. The workforce agreed to forgo a wage increase and a work redistribution programme was introduced. Early retirement was an important instrument in the downsizing process. The legal framework for this was based on the transition payments system (APG) for coal industry employees that state legislators had introduced in 1972. For those not entitled to APG, the 2012 'Agreement on the closure of the Ruhr coal industry' by 31 December 2018, negotiated between the German Coal Association (GVSt) and the trade union for mining, chemical and energy industries (IG BCE),

provided a specific social compensation plan. The Ruhr Coal Vocational Training Society (RKB), a 100 per cent subsidiary of Ruhr Coal AG, was put in place to manage labour market transitions. A map of existing and future skills demand was used to set up objectives and develop model projects. For each affected worker, an individual re-employment strategy was developed in co-operation with the regional government, the company management and the works councils. Having a specific mine closure agency to manage the transition and pursue targeted labour market transition programmes is another important lesson for future coal transitions.

The Ruhr area has undergone permanent structural change over the last sixty years and, albeit with pitfalls and setbacks, it has achieved a fundamental transformation from coal and steel to a knowledge-based economy. Fundamental structural change cannot happen overnight and requires proper preparation, but it is also very clear that no-one any longer has sixty years for this.

6.2 Hazelwood coal plant closure, Australia

Phasing out coal in energy generation has been on the Australian policy agenda for many years but contradictory policy objectives arising from changing political constellations have cancelled each other out. As an example, the Clean Energy Bill of 2011, with the 'Contract for Closure' programme for polluting power stations, was repealed in 2013.

In the Latrobe Valley where the Hazelwood plant is located, unions had already begun to hold a series of Climate Change Forums in 2007 to discuss the future of the region in a low-carbon environment and how to manage a just transition for the workers affected. The major change, however, came due to corporate business decisions made overseas (Snell 2018). In November 2016, Engie, the French energy company, announced a decision to close Hazelwood Power station in order to reduce its carbon emissions and as a result of the power station's age and high operating costs. The announcement of complete closure, with less than five months to prepare for it, came as a major shock to Hazelwood workers, unions and the local community.

The state government responded by establishing the Latrobe Valley Authority (LVA) to manage the mine closure and its consequences for the region with the involvement of trade unions, Engie itself and other power station owners, the local government and community organisations. Four major initiatives evolved to assist affected workers and their families:

- a Worker Transition Service (WTS) involving the LVA, the local labour council and local training providers to provide one-to-one transition services and skills development for all affected groups in the region;
- financial support for retraining: under Hazelwood's collective agreement, workers directly employed by Hazelwood were entitled to retraining funded by the company. For contract and supply chain workers, the federal government agreed to provide subsidised training support;

- a 'Worker Transfer' scheme agreed to by unions, power generators and the government to open up job opportunities for Hazelwood workers by launching early retirement schemes at other power stations in the sector;
- another initiative focused on regional revitalisation. Just transition requires employment opportunities for displaced workers in regions that, as here, are frequently structurally weak. The state government therefore established a 'special economic zone' with financial incentives.

Despite the sudden decision about the closure and its short-term focus, labour transitions were comparably well managed and social dialogue played a key role.

6.3 ENEL, Italy

Facing up to the challenges of energy transition and the EU's stricter emissions limits from 2021, ENEL set up its 'Futur-e Programme' thereby demonstrating the potential impact of the new EU pollution limits.

ENEL's CEO declared the company's ambition to become the world's first 'truly green energy giant' and achieve carbon neutrality by 2050. In May 2017 it announced the closure of two large coal power plants by 2018 and that it would close all its coal and lignite generation plants by around 2030.

The Futur-e programme also foresees the redevelopment of ENEL assets that have reached the end of their useful life. Once the transition issues surrounding workers have been resolved, a site conversion programme begins. Out of the 23 thermoelectric plants in the programme, nine have already begun a conversion plan, such as the reuse of facilities for tourism/hospitality, biotechnology centres, multi-functional centres, exhibitions of local food and wine, etc.

ENEL initiated a social dialogue process to reach a just transition framework agreement with its Italian union partners. The framework covers retention, redeployment, reskilling and, where appropriate, early retirement. This example of a just transition agreement in the power sector includes provisions for a recruitment plan using apprenticeships to ensure the knowledge transfer of the competences of older workers to younger ones, as well as encouragement for mobility and training so as to optimise internal resources. The framework also includes dedicated training measures to ensure qualifications and employability and for the creation of new skill sets targeted on the development of new businesses.

The above three cases represent coal transitions under different circumstances and at different levels: one transformation of an entire region with a population of five million people; one closure of a private coal-fired power plant that played a decisive role in a structurally weak region; and the decarbonisation strategy of a large multinational energy conglomerate. All demonstrate extensive multi-stakeholder social dialogue and well-elaborated employment transition programmes, and also included regional development initiatives.

7. National energy and climate plans, coal phase-out and just transition policies

EU member states are obliged to come up with national energy and climate plans in the framework of the Energy Union and Climate Action initiative of the European Commission. Specific plans for 2030 must quantify planned national contributions to achieving the EU's 2030 targets and deal with issues including the future composition of energy generation and the lifespan of existing coal-fired power plants.

In the past, structural policy has often had a reactive character after particular changes had already unfolded. Responses mostly appeared in interventions to bail out affected companies e.g. by providing financial incentives or, in terms of the employment effects, in providing compensation payments or early retirement for affected workers.

This is not, however, a viable strategy given the magnitude and the strategic importance of the current transformation. A forward-looking offensive strategy is needed that aims to tackle all the important aspects in a comprehensive manner, including climate policy objectives, energy security, social and employment effects and the future development perspective of the affected regions. A number of national plans with a focus on coal phase-out are presented briefly below.

7.1 Germany

In 2018, the German government set up a multi-stakeholder Commission on the coal industry – 'The Commission for Growth, Structural Change and Employment' – consisting of federal and regional politicians, employers, trade unions, NGOs and experts – to formulate recommendations and set up a timetable for the phasing-out of lignite mining and the decommissioning of coal-fired power plants in accordance with the country's long-term climate policy targets. The Commission concluded its recommendations to the federal government in January 2019. The plan would inject the equivalent of €40 bn over twenty years into coal-dependent regions.

The strategy paper follows three main objectives: to fulfil national climate policy targets; to manage the comprehensive restructuring of the affected coal regions; and to secure a stable and affordable energy supply.

In order to comply with the country's greenhouse gas reduction plans – a 40 per cent reduction by 2020 and a 60 per cent reduction by 2030 based on 1990

greenhouse gas emission levels – emissions from coal plants need to be reduced from 256m tonnes of CO_2 in 2016 to between 84 and 92m tonnes by 2030.

To manage structural change in German coal regions (in the Rhineland, the central German region and Lusatia), where tens of thousands of jobs are dependent on coal, medium- and long-term structural policies should be based on a 'structural policy law for brown coal regions' and the approach must be based on a priority list of specific projects.

Lusatia is Germany's second largest lignite mining region. In 2016, 62.3 million tonnes were mined here, corresponding to 35 per cent of Germany's lignite production. Many efforts have been made in the past to strengthen the region and to diversify it economically. To support this process, several institutions have been set up locally including, for example, the 'Innovationsregion Lausitz – iRL', a local agency which aims to support regional economic development. Its shareholders are the regional chambers of industry and commerce, the University of Cottbus and various other regional trade associations.

Regional development is a decisive aspect of the strategy for coal phase-out in Germany and the economic situation in the mining regions will be discussed as part of the energy policy discourse, including proposals on how miners or mining regions could be supported in the coming transition process. The focus so far, however, has been on proposals for national support programmes and less on European approaches.

The third priority of the recommendations of the Commission is to secure the competitiveness of German enterprises in the future, especially with regard to procuring a stable and affordable energy supply encompassing the maintenance of the future viability of energy firms that are affected by the exit from coal.

Consequently, it recommended that normal electricity consumers (such as households and SMEs) should be entitled to a reduction in the price of electricity via a cut in network charges (making up one-fifth of the electricity bill). It further recommended that energy-intensive industries should also be compensated for the costs that arise for them from the price of CO_2 pollution allowances. The regulation that is scheduled to run out in 2020 would, therefore, need to be extended (the yearly compensation so far amounts to €300m).

The Commission proposed that there should be compensation for power plants closed due to the implementation of climate policy targets. In earlier cases, compensation for lignite-fired plants was fixed at €600m/gigawatt (operational capacity remains at 20 GW). Hard coal power plants (with a total capacity of 23 GW) should also receive compensation for closure. Compensation should be subject to tender based on the decision of the federal government about the amount of capacity to be eliminated (in gigawatts), with energy firms applying with their request for compensation.

For the energy sector, the major issue will be how to bring about the Commission's recommendation to remove 7.7 GW of hard coal and 5 GW of lignite generation

capacity from the grid by 2022 (12.7 GW of capacity represents the equivalent of about 24 large power station units).

Under the proposed plans, coal power capacity in Germany would more than halve, to 17 GW by 2030. While the 2038 date for the exit from coal was in line with earlier expectations, according to the report the phase-out could be completed by 2035 — a decision that would be taken in 2032.

7.2 France

In November 2018, the French government published a revised version of the French National Low-Carbon Strategy (SNBC), which targets the climate neutrality of the country by 2050. The national Multiannual Energy Plan (PPE) for the period 2019-2028 sets out some initial measures aiming at realising this ambitious objective.

The closure of France's four last remaining coal power plants is a priority. These power plants, which employ slightly more than 1,000 workers, account for only a small share of the country's electricity production and CO_2 emissions. Despite this, the closure of the plants remains a sensitive issue. According to the trade union CGT, the plants encompass a total of more than 5,000 direct and indirect jobs. Since the closure announcement, several protests have been organised by workers, a majority of whom took strike action from December 2018 (Jakubowski forthcoming).

The French government announced, in 2018, the inclusion of these four sites in the pilot phase of the newly-created Ecological Transition Contracts programme (ETCs). ETCs can be seen as the French framework for just transition which aims to implement green economic diversification measures and social transition schemes in regions touched by the negative effects of the transition. ETCs are strategies that take the form of binding agreements (contracts), designed for and by regional authorities and companies, favouring the implementation of an economic and social transition to a low-carbon economy in French regions and territories. ETCs are based on local or regional low-carbon development strategies and are adapted to the economic and environmental specifics of each territory. Regarding their content, ETCs form the main axis of local low-carbon transition strategies with the objectives to be achieved in accordance with national climate policy targets. They include specific actions and investment projects seeking to achieve defined objectives and outline the roles that the different parties will play.

One year after the start of the programme, however, no ETC has been set for any of the plants. In the meantime, alternative projects targeting the conversion of three of the plants to biomass-fired units have been developed with the support of workers and trade unions. The Gardanne power plant (Uniper, 600 MW) was commissioned in 1984 and, in 2011, Uniper announced its intention to transform it into the largest biomass plant in Europe. Several tests have been done since 2016, but the project is now being questioned because of its high costs as well as

environmental concerns.[7]

Additionally, the government has announced a ban on investment in new fossil fuel-based production capacities, itself an ambitious target given also the intention to close several nuclear plants and reduce the share of nuclear energy in electricity generation to fifty per cent by 2025.

7.3 Spain

Spain will close nine coal-fired plants (5.5 GW) by June 2020 since these are due for retirement in line with EU pollution legislation. The minister responsible for power generation also confirmed that all coal-fired plants would close by 2025 as the country turns to gas-fired generation (Bronte 2018). The government has been working on a new climate law and on Spain's climate and energy plan, with a likely phase-out of coal by 2025.

Up to very recently, state aid continued to be provided for coal-fired power plants as did state subsidies for domestic coal production. However, the mines were due to lose their subsidies by the end of 2018 on the basis of an EU directive stopping production by 1 January 2019 at all coal extraction sites in receipt of public funds. For 26 mines in Spain, this represented the end. Two thousand workers were affected by the closures, with the government agreeing a deal with unions in October 2018 to smooth workers' access to benefits such as early retirement. A €250m fund was also earmarked for aiding business ventures and re-purposing disused mines.

7.4 Poland

There are currently two major strategic documents framing energy and climate policies in Poland. The first document, Polish Energy Policy until 2040 (PEP 2040) was drafted at the end of 2018 with the second, the National Energy and Climate Plan for 2021-2030 (NECP), coming at the beginning of 2019. Both remain in draft.

According to PEP 2040, hard coal will remain the single most important source of electricity production by 2040, although its role will be decreasing. In 2030, coal will be responsible for almost sixty per cent of electricity production although, by 2040, its share will have declined to less than thirty per cent (Szpor forthcoming). The expectation is that, with the modernisation of the energy sector and a more efficient use of coal, it will be possible to sustain the quantity of electricity produced

7. The project is facing strong opposition from numerous NGOs, the National Forest Office and the managing authorities of two national parks because of its potential negative impacts on the environment, resulting from Uniper's decision to fuel the power station with forest biomass. This is likely to have a detrimental effect on the local ecosystem, although only a minor part is to be sourced locally, the rest being imported from Spain and Brazil (and which also raises substantial issues).

from a decreasing amount of coal. Production for industry (energy and steel) will be shifting from thermal to coking coal for profitability reasons. Demand from the residential sector will be lowered by the promotion of district heating schemes, reducing at the same time the use of thermal coal in individual households. This will also contribute to a decrease in energy poverty and in air pollution. In segments which are not covered by domestic production, the import of coal will be allowed to meet demand.

The expected rising demand for electricity amidst a declining role for coal will be covered foremost by gas, wind and solar and, at a later stage, also by nuclear generation.

The current targets within climate and energy policy for the EU as whole assume far more ambitious goals than Poland is declaring to achieve. The NECP commits Poland to a reduction in greenhouse gas emissions from 468 Mt CO_2eq in 1990 to 367 Mt in 2030; that is, by 22 per cent compared with the forty per cent target at EU level.

There are strong connections between politics, the economy and the coal sector workforce in Poland. Previous attempts at restructuring the hard coal sector have been met by substantial protests and strikes by the unions (Dzieciolowski and Hacaga 2015). Coal is regarded as a means of energy security whilst also boosting both the local and the national economy, and different stakeholders from companies, workers and communities to political parties are, in general, strongly opposed to any reduction in coal use.

The current draft strategies regarding energy and climate remain incoherent and will be subject to substantial revisions during 2019. There will, inevitably, be pressure for a stronger reduction in the carbon intensity of the Polish economy and a consequent further reduction in the role of coal. Despite the best skills of the Polish government, the final version of both these documents may see greater reductions in the use of coal in the future energy mix. Consequently, the number of jobs in the sector may well decline further than expected based on current projections.

Within its strategies, the Polish government is putting the future of Poland's coal regions and its people at risk by ignoring the dominant trends: a stricter regulatory framework on emissions, pollution and state aid; the rapidly-changing competitiveness of alternative sources of energy generation; and the decision by investors to turn away from fossil fuel energy and, in particular, from coal.

Conclusions and recommendations

Phasing out coal is seen widely as a 'low hanging fruit' in decarbonisation efforts towards fulfilling climate policy commitments and making progress towards a net zero carbon economy by 2050. Coal-based energy generation and use make up a significant share of greenhouse gas emissions (15 per cent of total EU emissions) while, at the same time, these activities have a very low share in the total economy and, with direct employment of c. 170,000 in the EU28 in 2017, also a low weight in EU total employment. On the other hand, as we showed above, coal-dependent activities are concentrated in a small number of European regions (three-quarters of EU coal jobs are found in ten EU NUTS-2 regions across four countries). Germany and Poland make up over fifty per cent of electricity generation capacity in the EU based on hard coal and over two-thirds of the use of high-polluting lignite. Poland alone has nearly fifty per cent of direct jobs in coal mining and coal-fired power generation.

Coal mining and coal-based energy generation is already under significant pressure and this will only grow in the next decades. With the strict new upper limits for emissions entering into force from 2021 for large combustion plants, most of them will have to make tough decisions. As part of the Clean Energy Package, a stricter Emission Performance Standard (550g CO_2/kWh), which will limit state aid designed to secure reserve capacity in peak periods, will see 72 per cent of German and 91 per cent of Polish coal-fired power plants become non-eligible. This, together with the decreasing costs of renewable energy generation, will question the future viability of these power plants.

Based on national energy plans and government declarations, this paper showed how individual member states are planning the phase-out of coal. Six member states are already coal-free, while the majority of the others have designated the year in which they will become coal-free. France and Sweden will be the first in the early 2020s, followed by several other western European member states by 2025. Most of western Europe other than Germany will be coal-free by 2030, while Germany has just embarked on a slow-paced coal exit, at the latest by 2038. On the other hand, most central-eastern European member states have no plans to phase out coal and Poland seems to be sticking with coal for as long as possible given that the most recent Polish Energy and Climate Plan is reckoning on a thirty per cent share for coal in electricity generation by 2040. Estonia also seems to be insisting on the use of the highest possible polluting source of energy, i.e. oil shale.

Coal regions will have to undergo a radical restructuring process and will need to define a future for themselves – a future beyond coal. Given that climate mitigation is a collective effort in Europe, it seems fair that coal mining regions should receive support in overcoming the challenges of this transition.

This working paper also discussed the concept of 'just transition' and what it means for coal regions in practice, highlighting the possible role of EU-level policies to support it. It argued that, if just transition policies can have a real impact, it is certainly in coal transition where particular efforts are needed. The paper identified two key elements of the just transition concept that are particularly relevant to coal regions: employment transitions; and regional development. In coal transition, dealing with the employment effects of mine and plant closures and facilitating job transitions is the most important. At the same time, providing compensation and job transition perspectives for workers who have lost their jobs is not enough. The future of the regional economy is equally important with active industrial and regional policies being required in order to establish a new sustainable base for the regional economy. Cases and past experience also show that there is a clear distinction to be made between hard coal and lignite regions. Hard coal regions, like the German Ruhr in the past or Silesia in Poland, are strongly-industrialised regions with a high level of urbanisation. While coal mining and coal use plays an important role, there is a larger diversity of other sectors also having high shares in regional value creation. Brown coal regions, like the German Lusatia or the Polish Lodzkie region are, on the other hand, much weaker, often being rural areas with low population densities and in which employment in mining and the energy sector is the predominant employment factor.

Lessons from a number of case studies and the literature have helped to identify a couple of key elements constituting a successful just transition strategy for coal regions. Social dialogue and a meaningful involvement of stakeholders is necessary in all just transition cases. Given the magnitude of the coal transition and the stakes at regional level, the involvement of the government (at central and regional level) is necessary to manage the employment and economic impacts of mine and power plant closures. A properly-funded specific mine closure agency, or a specialised agency for employment transitions, is needed to manage transitions over several years (the case of the Ruhr is a good example, as is the Australian case of the Hazelwood plant).

Forward-looking policies that actively manage the transition are vital to success; losing time by trying to maintain the status quo will only make the effects worse and increase the costs of the transformation. At the same time, a successful transition also takes time and preparation. Pre-layoff planning and assistance can prepare workers for impending layoffs with timely information and consultation. Proper just transition policies need to recognise the needs of different groups of workers, including older workers close to retirement and workers at different stages of their career, and must pay attention also to vulnerable groups. Individualised active labour market policies and personal coaching are both essential.

This paper also looked at the possible role of EU-level initiatives and funding for supporting the phase-out of coal. If we regard the leverage gained by the reconversion of a small number of EU regions (that make up the bulk of coal mining and use in the EU) in reaching EU climate policy targets, the rationale for active EU support is unquestionable.

The Coal Regions in Transition Initiative of the Commission is useful but needs to be developed further. Providing toolkits and guidelines for a successful coal transition, and sharing experiences among affected regions, is a good start, but assistance provided for the better use of available EU funding schemes is also helpful. EU structural policy certainly provides a comprehensive and valuable resource on which European coal regions can draw, but the available tools are, however, not being used in a systematic manner. An explicit funding priority dedicated to coal transition could be integrated into ESI funding schemes, while a more targeted programme under the European Regional Development Fund (ERDF) could contribute a part of the funds required for the explicit support of regional transitions to a zero-carbon economy.

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https://geology.com/rocks/coal.shtml

All links were checked on 19.03.2019.

Glossary

BREF - "Best Available Techniques Reference Document" sets new upper limits for the emission of oxides of nitrogen and sulphur (NOX and SOX) by large installations that burn carbon-based fuels (European Commission 2017).

Biomass means the biodegradable component of products, waste and residues of biological origin from agriculture, including vegetable and animal substances, and from forestry and related industries, including fisheries and aquaculture, as well as the biodegradable component of waste, including industrial and municipal waste of biological origin (European Union 2018). For biomass to be effective at reducing greenhouse gas emissions, it must be produced in a sustainable way.

European Energy Programme for Recovery (EEPR) was launched by the European Commission in 2009 with a budget of €1.6bn to support carbon capture and storage (CCS) and offshore wind projects.

Efficiency of power plants is explicitly a measurement of how much of a given resource's energy potential gets turned into electricity. An average 35 per cent efficiency of coal-fired power plants in Europe means that 65 per cent of energy is being lost as waste. Gas-fired power plants manage an efficiency of about 54 per cent while solar panels average just 20 per cent (wind energy efficiency is in the range of 40 to 77 per cent). In the case of renewables, efficiency loss is not a problem as the resource has no extra cost and does not generate greenhouse gas emissions or other pollutants (Forbes 2017).

Oil shale is a sedimentary rock containing kerogen, a petroleum-like liquid that the rock releases when heated (oil shale is not to be mixed up with shale oil and shale gas that are essentially oil and gas trapped in shale formations). In the EU, oil shale is only mined in Estonia, where it has been in use for electricity generation since the 1950s. Oil shale is the most polluting source of energy generation and it produces large amount of hazardous waste and emits more greenhouse gases per megawatt of energy generated than any other fuel (Sandatlas).

Hard coal, often referred to as anthracite, is a hard, compact variety of coal. It has the highest carbon content (92-98 per cent), the fewest impurities and the highest energy density of all types of coal and has the highest rank among coals. Extracted via deep mining methods (Geology.com).

Lignite, often referred to as brown coal, is a soft, brown, combustible, sedimentary rock formed from naturally-compressed peat. It is considered the lowest rank of coal due to its relatively low carbon content, of around 60-70 per cent, and is the type of coal most harmful to health. Due to its high moisture content and low energy density, carbon dioxide emissions from brown coal-fired plants are much higher per megawatt generated than for comparable black coal plants. It is extracted through surface mining all around the world and is used almost exclusively as a fuel for electric power generation.

Carbon capture and storage (CCS) and Carbon Capture and Utilisation (CCU) are seen as options during the transition of coal regions as they offer the possibility to use coal for power generation while capturing and permanently storing the CO_2 formed during the power generation process.

Capacity mechanism is a national subsidy (public money) paid by several EU member states to power plants for making stand-by electricity generation capacity available to meet demand peaks. Such mechanisms must conform to EU guidelines on state aid for environmental protection and energy that make any subsidy payments conditional on the fulfilment of certain environmental and emissions standards.

New entrants' reserve (NER 300): The New Entrants' Reserve is a community-wide reserve of 780 million emission allowances established under the EU Emissions Trading System for the 2013-2020 period. During this time, new EU ETS operators can apply for an allocation of allowances from this reserve. The reserve supplies allowances on a first-come, first-served basis. 300 million allowances from this reserve were set aside in 2012 to fund NER300.

Solid fuel is a category used by Eurostat, mainly referring to hard coal and lignite but also including oil shale (in the EU only Estonia uses oil shale for electricity generation).

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