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**Towards An Inclusive Energy
Transition Beyond Coal - A
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**Erpu Zhu, Loyle Campbell, Manfred Hafner, Xinqing Lu, Michel
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By Erpu Zhu, Sciences Po – Paris School of International Affairs
Loyle Campbell, Sciences Po – Paris School of International Affairs
Manfred Hafner, Fondazione Eni Enrico Mattei, Sciences Po – Paris School of International Affairs, The John Hopkins University – School of Advanced International Studies
Xinqing Lu, Sciences Po – Paris School of International Affairs
Michel Noussan, Fondazione Eni Enrico Mattei, Sciences Po – Paris School of International Affairs, Decisio
Pier Paolo Raimondi, Fondazione Eni Enrico Mattei, Istituto Affari Internazionali

Summary

This paper compares different just transition pathways in China, the European Union and the United States of America by comparing the current state of the coal sector and just transition policies away from coal. How can social justice in the energy transition be achieved under different models of energy governance? Since these three blocs have only made some progress on just transition policies and legislations for workers and communities impacted by the coal phase down or phase out in recent years, there have not been many studies comparing them to each other. The analysis in this paper shows that while all three blocs work towards ensuring the integration of coal workers and coal communities into the clean economy in the process of coal reduction, their approaches to achieving a just transition differ in terms of policy frameworks, financing resources, specific measures and public participation. This paper is part of a series of FEEM working papers of comparison studies of China, the EU and the US in the field of climate and energy.

Keywords: Energy Transition, Just Transition, Coal Phase Out, Inclusiveness, China, the European Union, the United States.

JEL Classification: Q38; Q56; Q58

Address for correspondence:

Erpu Zhu,
Sciences Po – Paris School of International Affairs
28 Rue des Saints-Pères, 75007 Paris
E-mail address: erpu.zhu@sciencespo.fr

The opinions expressed in this paper do not necessarily reflect the position of Fondazione Eni Enrico Mattei

Corso Magenta, 63, 20123 Milano (I), web site: www.feem.it, e-mail: working.papers@feem.it

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By Erpu Zhu, Sciences Po – Paris School of International Affairs

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Abstract:

This paper compares different just transition pathways in China, the European Union and the United States of America by comparing the current state of the coal sector and just transition policies away from coal. How can social justice in the energy transition be achieved under different models of energy governance? Since these three blocs have only made some progress on just transition policies and legislations for workers and communities impacted by the coal phase down or phase out in recent years, there have not been many studies comparing them to each other. The analysis in this paper shows that while all three blocs work towards ensuring the integration of coal workers and coal communities into the clean economy in the process of coal reduction, their approaches to achieving a just transition differ in terms of policy frameworks, financing resources, specific measures and public participation.

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1. Introduction

It is a global consensus that coal power generation is the largest contributor to global warming and the main obstacle to achieving the Paris Agreement to limit the temperature increase to 1.5 °C compared to pre-industrial levels by the 21st century. However, coal is still the primary source of power generation: in 2020, coal represented 35% of the power generation mix (IEA, 2021a). Prior to the Covid-19 pandemic, coal-fired power generation accounted for 30% of global CO₂ emissions in 2018 (IEA, 2020). While the pause in economic activities hit demand for coal during the early stage of the pandemic, global coal use is expected to have picked up again in 2021 and drive global CO₂ emissions up by around 640 Mt of CO₂, due in large part to a rapid increase in coal use for power generation in Asia (IEA, 2021b).

Currently, countries are being urged to step up their efforts to reduce emissions from coal power generation. Since the Paris Agreement in 2015, 76% of proposed coal power plants have been cancelled, which totalled 1,175 GW of capacity. (Littlecott et al., 2021). COP26 in Glasgow, the United Kingdom in late 2021 saw another milestone in a “no coal future”: 46 countries, including 23 new committers signed the *Global Coal to Clean Power Transition Statement*, which pledges to phase

out unabated coal power in the 2030s for major economies and in the 2040s globally, while “ceasing issuance of new permits for new unabated coal-fired power generation projects”.¹

Nevertheless, the exit of coal power is much more than rhetoric. The transition of the coal sector is not simply an ambitious story of environmental sustainability: the closure of coal mines and power plants can have significant negative economic and social consequences for countries or regions dependent on energy-intensive industries, and this can happen before the energy transition creates new and additional opportunities and jobs. Calling a halt to the construction of new plants may be relatively easy to achieve, yet reducing emissions from existing assets is far from a paper exercise, which may require considerable political will, financial input and social support (IEA, 2021c). In the world today, there are approximately 8,500 coal power plants in operation that generate 2,000 GW of electricity, accounting for more than a third of all electricity (Biro & Malpass, 2021). Behind these figures are stakeholders in all parts of the coal chain, including coal workers (serving for extraction, transportation, processing, etc.), and their families, coal-dependent communities and corporations.

Policymakers are being tested by the development of public policies that ensure justice and fairness in the energy transition and the inclusion of those people and communities most affected by the transition of the coal sector. In the meantime, the concept of “just transition”, which refers to the goals of “decent work for all, social inclusion and the eradication of poverty” when transitioning towards an environmentally sustainable economy (International Labour Organization, 2015), is being mentioned more frequently in coal sector policies.

How can we ensure a just transition away from coal and create an inclusive energy future for all stakeholders? There is no universal standard here - strategies and policies are diverse, taking into account the economic, social and environmental realities of different countries or regions. China, the European Union and the United States are the top three economies aiming for net-zero emissions (Froggatt & Quiggin, 2021), and they are, or were, the world’s top coal power-using geo-economic blocs. China is currently the world’s biggest coal consumer with a large coal industry and a significant number of stakeholders in various regions. The EU proposed in the European Green Deal to become the world’s first climate-neutral continent by 2050 through clean energy transition and a circular economy. 50% of coal plants in Europe have been closed since the Paris Agreement, but there are still coal-reliant members who are reluctant to commit to coal plant decommissioning (Bloomberg, 2021). The US is the world’s third-largest coal consumer who has closed around 25% of its coal capacity in the past decade. However, coal still “retains its political power”, especially from those coal-producing states (Storow, 2021). The past and ongoing coal phase out efforts of these three blocs can bring a wealth of policy lessons and implications on a just transition away from coal.

This paper analyses and compares the just transition policies away from coal in China, the EU and the US, with a focus on policies related to coal industry workers and coal-reliant communities. This paper aims to compare different strategies for achieving a just transition away from coal in China, the EU and the US. While there are a number of separate analyses that examine the just coal sector transition in China, the EU and the US, the comparative path helps see at a glance the policy choices of different countries or regions in different political and economic contexts, and thus to better grasp the complexity of just and inclusive transitions.

¹ UN Climate Change Conference UK 2021, <https://ukcop26.org/global-coal-to-clean-power-transition-statement/>

This paper is part of a series of FEEM working papers of comparison studies of China, the EU and the US in the field of climate and energy. Topics in this series of papers include comparisons of decarbonization of the power sector (Noussan et al., 2021), energy and climate governance (Lu et al., 2022), power battery securities (Campbell et al., 2022), the security of rare earth minerals (Raimondi et al., 2022) and just transition strategies away from coal presented in this paper.

2. Coal sector profiles of China, the EU and the US: National Strategies, Coal Regions and People

2.1 Coal profiles of China, the EU and the US

A synthesis of some indicators related to the basics of social economy and the coal sector to compare China, the EU and the US is reported in Table 1. Although all three blocs have more or less proposed responses to decarbonization and climate change by moving away from coal, Table 1 presents a very different picture of the present coal sector, their various levels of dependence on coal, and the implied challenges of achieving a just energy transition away from coal.

Table 1 - Key indicators on the coal sector in China, the EU and the US

			China*	European Union**	United States***
	Type	Date	Country	Union of countries	Country
Total population ²	Million	2019	1,398	448	328
Total GDP ³	Billion USD	2019	14,280	15,626	21,433
GDP growth rate ⁴	%	2019	5.95	1.765	2.161
Total electricity generation ⁵	TWh	2019	7,503.4	2,892.5	4,411.2
Coal and electricity					
Electricity generation by coal ⁶	TWh	2019	4,849.7	475.1	1,051.1
Share of coal in the electricity generation mix ⁷	%	2019	64.6	16.4	23.8
Coal power capacity in operation ⁸	MW	As of July 2021	1,046,893	117,749	232,772
Coal power stations in operation ⁹	No.	As of July 2021	1,087	224	246

² World Bank Data, Total population, <https://data.worldbank.org/indicator/SP.POP.TOTL>

³ World Bank Data, Nominal GDP, <https://data.worldbank.org/indicator/NY.GDP.MKTP.CD>

⁴ World Bank Data, GDP growth (annual %), <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=US>

⁵ BP Statistical Review of World Energy 2021, <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2021-full-report.pdf>

⁶ BP Statistical Review of World Energy 2021, <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2021-full-report.pdf>

⁷ The calculation of this indicator is based on the result of dividing electricity generation by coal by Total electricity generation.

⁸ Global Energy Monitor: Coal Plants by Region (MW), Coal Plants by Country (MW), <https://globalenergymonitor.org/projects/global-coal-plant-tracker/summary-tables/>

⁹ Global Energy Monitor: Coal Plants by Region (Power Stations), Coal Plants by Country (Power Stations), <https://globalenergymonitor.org/projects/global-coal-plant-tracker/summary-tables/>

Coal power capacity announced, pre-permit, or permitted ¹⁰	MW	As of July 2021	163,342	500	0
Coal power stations pre-construction, or construction ¹¹	No.	As of July 2021	238	4	0
Coal power and CO ₂ emissions					
Annual CO ₂ emitted (for plants under operation) ¹²	Mt	As of July 2021	4,518	595	1,138
Lifetime CO ₂ emitted (for plants under operation) ¹³	Mt	As of July 2021	129,581	5,583	9,392
CO ₂ emissions per unit of electricity generated by coal ¹⁴	g/kWh	2019	931.6	1,252.4	1,082.7
Coal mines					
Number of major coal mines in operation ¹⁵	No.	As of June 2021	297	33	48
Number of major coal mines proposed ¹⁶	No.	As of June 2021	126	0	12

* Excluding the 2 Special Administrative Regions (Hong Kong and Macau) and 1 disputed region (Taiwan).

** The European Union considered in this study is the EU-27, after the withdrawal of the United Kingdom (UK) on Jan 31st, 2020.

*** Excluding District of Columbia.

2.2 Challenges in China's coal sector

One of the biggest obstacles to achieving carbon neutrality by 2060 in China, the country with the world's largest population, is its huge dependence on coal. The Chinese government is making a commitment to phase down coal to promote its own economic transformation as well as responding to international pressure to tackle climate change. In its latest released *Action Plan for Carbon Dioxide Peaking Before 2030*, China aims to “strictly and rationally limit the increase in coal consumption over the 14th Five-Year Plan period and phase it down in the 15th Five-Year Plan period (National Development and Reform Commission, 2021)”. With Chinese President Xi Jinping pledging to stop building overseas coal power plants, expectations are still high as to when China will signal a halt to the construction of coal power plants at home. The decline in the share

¹⁰ Global Energy Monitor, Coal Plants by Region (MW), Coal Plants by Country (MW), <https://globalenergymonitor.org/projects/global-coal-plant-tracker/summary-tables/>

¹¹ Global Energy Monitor, Coal Plants by Region (Power Stations), Coal Plants by Country (Power Stations), <https://globalenergymonitor.org/projects/global-coal-plant-tracker/summary-tables/>

¹² Global Energy Monitor, Coal Plants by Region: Annual CO₂, Coal Plants by Country, Annual CO₂, <https://globalenergymonitor.org/projects/global-coal-plant-tracker/summary-tables/>

¹³ Global Energy Monitor, Coal Plants by Region: Lifetime CO₂, Coal Plants by Country, Lifetime CO₂, <https://globalenergymonitor.org/projects/global-coal-plant-tracker/summary-tables/>

¹⁴ The calculation of this indicator is based on the result of dividing Annual CO₂ emitted (for plants under operation) by electricity generation by coal (2019).

¹⁵ Global Energy Monitor, Number of Major Mines by Region, Number of Major Mines by Country, <https://globalenergymonitor.org/projects/global-coal-mine-tracker/summary-tables/>

¹⁶ Global Energy Monitor, Number of New Mines by Region, Number of New Mines by Country, <https://globalenergymonitor.org/projects/global-coal-mine-tracker/summary-tables/>

of coal in the electricity generation mix in recent years has also shown a positive trend in China's move away from coal: between 2016 and 2020, the share of coal consumption fell from 65.51% to 60.75% (Our World in Data, 2021).

However, nearly two-thirds of electricity generation comes from coal, a much higher figure than in the EU and the US, where coal accounts for only 16.4% and 23.8% of their power portfolios. Over the past few decades, the reliability of coal resources for power generation and its affordability have been one of the main contributors to China's emergence as "the world's factory", and also the world's second-largest economy, while the fact that China's economy still maintains medium-to-high growth rates (5.95% GDP growth in 2019 and 2.3% positive growth in 2020 during the global pandemic¹⁷) seems to indicate that coal's position as China's primary energy source will be difficult to shake anytime soon. Compared to the EU and the US, China has not only much higher coal power capacity in operation, but also 163,342 MW of planned new coal power plant capacity. At the same time, the data in Table 1 illustrates that China releases less CO₂ per unit of electricity generated by coal than the EU and the US since the average age of coal power plants in China is much lower than in the EU and the US (Myllyvirta, et al., 2020). The fact that Chinese coal power plants have a younger age and higher thermal efficiency may make their being phased out in a short time more economically unacceptable. High coal prices and power outages in 2021 have warned the Chinese authorities of the need to focus on energy security aspects in their decarbonization strategy as "ensuring security" and "enhancing supply" are frequently mentioned in high-level meetings and policy documents. In a statement made by the Chinese premier, Li Keqiang after a meeting of Beijing's National Energy Commission, China will continue to "construct advanced coal power according to development needs".¹⁸

In addition to the economic realities, another challenge for China to move away from coal is a large number of provinces and regions with coal industries, the large number of people working with coal and the communities associated with the coal industry. Shanxi, Inner Mongolia and Shaanxi are the three provincial-level coal mining regions in China and their local economy is highly dependent on resource-based industries. In the Inner Mongolia Autonomous Region, for example, the share of enterprises in energy-intensive industries in the region's industries above the scale is nearly 50%, and energy and raw material industries account for 87.2% of the added value of industries above the scale (Xu, 2021). Under the pressure of the central government to achieve carbon peaking by 2030¹⁹, the control of total energy consumption and energy use intensity (能效双控)²⁰, the major coal-producing regions are trying to get rid of the path dependence on fossil energy economy and seek industrial transformation.

The employees of the coal industry are the most affected group. The decade from 2002 to 2012 is known as the "Golden Decade" of rapid development of the coal industry in China, along with

¹⁷ World Bank Data, GDP growth (annual %), China, <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=CN>

¹⁸ Based on a statement made by the Chinese premier, Li Keqiang after a meeting of Beijing's National Energy Commission, <http://www.scio.gov.cn/tt/34849/Document/1714397/1714397.htm>

¹⁹ On September 22, 2021, Chinese President Xi Jinping announced at the 75th session of the United Nations General Assembly that China will achieve carbon peaking by 2030 and carbon neutrality by 2060, http://www.gov.cn/xinwen/2021-09/22/content_5638597.htm

²⁰ The control of total energy consumption and energy use intensity was introduced by the NDRC in 2021 to promote energy conservation, <https://www.ndrc.gov.cn/xwdt/tzgg/202109/P020210916534072411763.pdf>

high production, soaring prices and profits, and the number of employees increased from 3.77 million to a peak of 5.3 million (China Coal, 2020). However, over the 13th Five-Year Plan period (2016-2020), due to the “cutting overcapacity” for key industries directive under the supply side reform²¹, around a total of 5,500 coal mines and more than 1 billion tons of coal production capacity was shut down (Xinhua News, 2021). Meanwhile, the number of employees in China’s coal industry has dropped from nearly 4.5 million in 2015 to about 2.6 million in March 2020 (China Coal, 2020). Furthermore, the increased efficiency of coal power production is expected to result in less demand for employees: the number of employees needed for 10,000 tons of coal in China fell from 55 in 1990 to less than 10 people in 2020 (China Coal, 2020). When industrial transformation occurs along with technological advances, it will be a dilemma to protect the people and communities affected by the industry and to promote the clean energy transition away from coal.

2.3 The complexity of coal phase out for coal regions in the European Union

The EU proposed in the European Green Deal to become the world’s first climate-neutral continent by 2050 through a clean energy transition and circular economy. To meet the goal of reducing greenhouse gas emissions by 55% below 1990 levels by 2030²², the rapid phase out of coal and the application of clean technologies is key to decarbonizing the energy system at a low cost. Currently, the EU’s share of coal in the electricity generation mix is only 16.4%, the lowest among the three blocs of China, the EU and the US, and the EU’s total coal generation has fallen by nearly one-third since 2012 (European Commission, 2021a). In addition, the operating coal capacity in the EU is only nearly 50% of that in the US and only 11.2% of that in China.

Many EU countries have responded to the EU’s climate ambitions by laying out timelines for coal decommission before or after the introduction of the European Green Deal. As shown in Table 2, by December 2021, four of the 27 EU member states have already achieved a coal-free electricity mix, six have committed to phase out coal by 2025, four have committed to close coal plants by 2030, and five pledged to remove coal by 2050. A further two countries are still discussing the coal phase out agenda, while six countries have coal not in their electricity generation mix in the first place.

Table 2 - EU member states’ coal phase out schedule

Category	Country	Year of phase out	Announcement
Coal-free as of December 2021	Belgium	2016	The last coal power plant was closed in March 2016.
	Austria	2020	The last coal power plant was closed in April 2020.
	Sweden	2020	The last coal power plant was closed in April 2020.
	Portugal	2021	The last coal power plant was closed in November 2021.
Phase out by 2025	France	2022	Announced by President Macron in 2017 and was included in the Energy and Climate Bill in 2019.

²¹ According to the State Council, cutting overcapacity is a method of seeking to transform and upgrade production facilities and products in order to address the oversupply of products, http://www.gov.cn/zhengce/2016-03/11/content_5052097.htm

²² This is mentioned in the EU’s 2030 Climate Target Plan, https://ec.europa.eu/clima/eu-action/european-green-deal/2030-climate-target-plan_en

	Slovakia	2023	The Environment Minister declared 2023 as the target year for Slovakia's coal phase out in 2017.
	Hungary	2025	Announced by Hungary's secretary of state for EU affairs in 2021.
	Italy	2025	Announced in the National Energy Strategy by the Italian Government in 2017.
	Ireland	2025	Announced by the Irish minister for communications, climate action and environment in 2018.
	Greece	2025	Announced by Greece's Secretary General for Energy and Mineral Resources at Ministry for the Environment and Energy in 2021.
Phase out by 2030	Finland	2029	Confirmed by Finland's environment minister in 2018.
	Netherlands	2030	Confirmed in a law adopted in 2019 banning the coal use for electricity generation as of 1 January 2030 at latest.
	Spain	2030	Spain joined the Powering Past Coal Alliance to set a date for closing all coal plants by 2030 in 2021.
	Denmark	2030	Confirmed by an energy agreement is unanimously approved by Parliament in 2018.
Phase out before 2050	Romania	2032	Confirmed in the official recovery plan set up in 2021.
	Croatia	2033	Announced by the Croatian Prime Minister in 2021.
	Slovenia	2033	Announced by Slovenia's infrastructure minister in 2021.
	Germany	2038 (2030)	Confirmed in the Act to Reduce and End Coal-Powered Energy and Amend Other Laws entering into force in 2020. The new German Government, inaugurated in December 2021, has declared its intention to phase out coal by 2030.
	Poland	2049	Confirmed in an agreement signed with the coal mining industry by Poland's government and unions in 2021.
Under discussion	Czech Republic	Earlier than 2038 proposed	A recommendation was sent by the Czech government to phase out coal by 2038 to the state commission.
	Bulgaria	2035, 2038, 2040 proposed	The National Assembly of Bulgaria will choose from 2035, 2038 or 2040 as a deadline to phase out coal.
No coal in electricity generation mix	Cyprus		
	Estonia		
	Latvia		
	Lithuania		
	Luxembourg		
	Malta		

Sources: *Europe Beyond Coal*, *EU Coal Exit Timeline*, <https://beyond-coal.eu/coal-exit-timeline/>
European Commission, *Coal in Europe's energy mix*, https://ec.europa.eu/energy/topics/oil-gas-and-coal/EU-coal-regions/coal-regions-transition_en#coal-in-europe-s-energy-mix

Overall, the position of coal is rapidly declining in the EU countries. However, the EU is not ironclad as far as coal phase out is concerned, since there are some countries in the EU that have so far heavily relied on coal for their electricity generation, most of them in Central, Eastern and Southeastern Europe. As Table 3 shows, Poland, Germany and the Czech Republic are the top coal producers in the EU in 2019, whose coal production reached 1.87 EJ, 1.19 EJ and 0.56 EJ in 2019. Table 4 presents that in the same year, five EU countries have a coal share of more than 25% of their power generation mix, namely Slovenia (28.01%), Germany (28.4%), Czech Republic

(44.15%), Bulgaria (39.71%) and Poland (73.08%). Correspondingly, these are also the countries that have committed to the coal phase out late or are still under discussion.

Table 3 – The eight EU member states with the highest coal production in 2019

Country	Year of coal phase out	Coal production (Exajoules [EJ])	Country	Year of coal phase out	Coal production (Exajoules [EJ])
Hungary	2025	0.04	Germany	2038	1.19
Greece	2025	0.21	Poland	2049	1.87
Spain	2030	0.07	Czech Republic	Not confirmed	0.56
Romania	2032	0.16	Bulgaria	Not confirmed	0.20

Source: BP Statistical Review of World Energy 2021, <https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html>

Table 4 - The share of coal in the electricity generation mix in non-coal free EU member states in 2019

Country	Year of coal phase out	The share of coal in the electricity generation mix in 2019 (%)	Country	Year of coal phase out	The share of coal in the electricity generation mix in 2019 (%)
France	2022	0.78	Denmark	2030	14.10
Slovakia	2023	8.82	Romania	2032	22.88
Hungary	2025	11.63	Croatia	2033	12.91
Italy	2025	6.78	Slovenia	2033	28.01
Ireland	2025	1.95	Germany	2038	28.40
Greece	2025	24.43	Poland	2049	73.08
Finland	2029	6.64	Czech Republic	Not confirmed	44.15
Netherlands	2030	14.57	Bulgaria	Not confirmed	39.71
Spain	2030	4.51			

Source: Our World in Data based on BP Statistical Review of World Energy & Ember (2021), <https://ourworldindata.org/electricity-mix>

In the coal-reliant Central and Eastern EU countries, which are often accompanied by coal, steel, energy or coal chemical-based clusters, the drawdown of the coal industry often has regional and social implications and associated job losses (Kustova et al., 2021). In Poland, obstacles to reducing coal production and consumption have come from different actors, including coal companies, trade unions, civil society and the government as well as their coalition, which has kept Poland from making the difficult commitment to retire coal in 2049 until 2021 (Brauers & Oei, 2020). Coal has a long history in Poland, with around 90,000 workers still employed in the coal mining industry until 2020. Convincing stakeholders that the energy transition has the prospect of prosperity in looking for alternative career paths is crucial for the EU.²³ Also, coal communities represent a large number of political votes - which has often divided the Polish government in

²³ This is based on the speech given by Frans Timmermans, the Executive Vice-President of European Commission, at COP26 high-level roundtable on international just transition: “If your prospects are just prospects of loss, loss of your job, loss of the economic structure where you come from, you will resist change, even if you know that the situation you are in is not sustainable”, https://ec.europa.eu/commission/commissioners/2019-2024/timmermans/announcements/frans-timmermans-cop26-high-level-roundtable-international-just-transition_en

terms of ending coal (Wiech, 2020). The drive to move away from coal in search of a more sustainable economy has emerged in some municipalities, but the intricate restructuring has not been accomplished by most governments at the central level since 1989 (World Wide Fund for Nature, 2020; Harper, 2020). Poland lags in its pledge to end its dependence on coal as its main energy source and is also one of the leading countries to veto EU policies against climate change, reflecting Poland's willingness to take on its coal industry (Jan-kowska, 2017). Moreover, spiking energy and electricity prices in Europe in 2021 are also dampening confidence in decommissioning coal plants in EU countries that rely on coal power.

Nevertheless, coal is increasingly becoming less of an economic option for these countries. Rising carbon pricing is having an impact on reducing coal-fired power generation: the ETS, which is expected to reach 65 euros per tonne of CO₂ equivalent by 2030, will impose higher costs on coal use. Support for coal will also become increasingly fragile in the political and investment spheres (Kustova et al., 2021). Demographically speaking, the phase out of coal may not only be a challenge but also an opportunity for industrial workers and coal regions - they may be a pool of labor for key EU industries where labor is becoming scarce.

2.4 Regional coal reduction issues in the United States

The United States has a long history of coal. It has the highest proven coal reserves in the world and is currently the world's third-largest coal consumer. As of 2019, there are 1,134 active mines in the US, which produced 706 million short tons in the same year (Statista, 2021). This number has been declining since the mid-2000s as the demand for coal for electricity generation has dropped (Energy Information Administration, 2021a). In 2019, coal-fired generating units in the US produced 966,000GWh of electricity, reaching the lowest level since 1976, and this accounted for around 23.2% of the generation mix, which is higher than the EU but much lower than China (EIA, 2020).

However, though due to the rise in gas prices, the US coal generation is expected to increase in 2021 (EIA, 2021b), it is a fact that coal has declined rapidly in the US over the past decade. As shown in Table 1, a significant difference between the US and China and the EU is that there are no more coal power plants under construction or planned in the US. It was economic rather than political reasons that led to this (Uhler, 2021). Weak electricity demand, the large availability of natural gas, which has become cheaper and more accessible due to fracking, becoming the choice for power generation for utilities, and the declining cost of renewable energy have all contributed to the closure of coal power plants in the US (Storrow, 2021; Uhler, 2021). Former President Trump used the revival of the coal industry as his electoral weapon to attract votes from coal communities that felt they had been abandoned by political groups that support the transition. He pursued a number of policies to revive the coal industry during his term, e.g., reviewing the Clean Power Plan formed during the Obama administration with an aim to tackle climate change, waiving reviews required by the *National Environmental Policy Act* (EPA), publishing the *Affordable Clean Energy* (ACE) which might extend the lives of coal power units and coal-fired power plants, and reducing the royalty rates for fossil fuels, etc (Gruenspecht, 2019). However, none of these attempts has been able to redeem the decline in US coal. During Trump's term, around 15% of the coal power capacity in the US was eliminated (Lipton, 2020).

The Biden administration has placed tackling climate change at the center of its national security and plans to restart the review of existing permits for fossil fuels development (Barsotti, 2021). In

August 2021, the Biden administration announced an intent to conduct “a formal review of coal sales on federal lands” to analyze its impact on climate change and the interests of taxpayers (Bureau of Land Management, 2021). However, though President Biden plans to return the US to international leadership in the global efforts against climate change, the United States did not join the *Global Coal To Clean Power Transition Statement* in COP26. In the unique political system of the United States, coal still retains considerable political power in the country, especially when senators from coal-reliant states have swing votes in the Senate (Storow, 2011). A recent example might be the Biden administration’s Clean Electricity Performance Program (CEPP), which would have spent USD 150 billion in subsidies on clean energy to move away from fossil fuels and achieve its emissions reduction vision, was “scrapped from reconciliation” in late 2021 after Senator Joe Manchin, a swing-vote from the coal-dependent state of West Virginia opposed it (Davenport, 2021; Dumain, 2021).

Table 5 – Share of coal in the electricity generation mix in 9 states in 2019 and 2020

State	Share of coal in the electricity generation mix in 2019 (%)	State	Share of coal in the electricity generation mix in 2020 (%)
Nebraska	55	Nebraska	51 (↓)
Indiana	59	Indiana	53 (↓)
North Dakota	63	North Dakota	57 (↓)
Utah	64	Utah	62 (↓)
Kentucky	73	Kentucky	69 (↓)
Missouri	73	Missouri	71 (↓)
Wyoming	84	Wyoming	80 (↓)
West Virginia	91	West Virginia	88 (↓)
Montana	52	Montana	36 (↓)

Source: New York Times: <https://www.nytimes.com/interactive/2020/10/28/climate/how-electricity-generation-changed-in-your-state-election.html?searchResultPosition=1>

Nuclear Energy Institution: <https://www.nei.org/resources/statistics/state-electricity-generation-fuel-shares>

Wyoming, West Virginia, and Pennsylvania are the top three coal-producing states in the US, accounting for 59% of the total coal production (EIA, 2021a). Meanwhile, as shown in Table 5, in 2019, coal accounts for more than 50% of the electricity generation mix in 9 states: Nebraska, Indiana, North Dakota, Utah, Kentucky, Missouri, Wyoming, West Virginia, Montana. In 2020, this figure became 8. At the same time, while the reliance on coal for electricity generation remained high in these states, their proportions still fell in absolute terms compared to 2019. Coal phase out is now a main challenge for some states, however, even in the coal-oriented states, it is falling out of favour (Tsafos, 2021). The falling status of coal brought with it the decline of coal communities, the sluggishness of the economies of coal-centric states, and massive job losses among coal industry workers. As Graph 1 presents, the total number of employees in the US coal mining industry has continued to decline rapidly over the last decade. This explains the discontent among unemployed workers in the coal industry and why both Trump and Biden have made helping unemployed workers get back to work and ensuring justice in the economic transformation a key point of their election campaign. The decline of the coal industry also has a disruptive impact on local economies. For example, Boone County, West Virginia, used to generate surpluses from state taxes levied on coal companies. But budget deficits, population outflows, and severe cuts in public benefits and jobs occurred after coal company bankruptcies (Energywire, 2020).

Graph 1 - Total amount of employees in coal mining in the US (2011-2020) (Thousands)



Source: Federal Reserve Economic Data (FRED), <https://fred.stlouisfed.org/series/CEU1021210001>

3. Just transition policies away from coal in China, the EU and the US

The section above gives an overall picture of the coal sector in China, the EU and the US. Given these analyses, the following section will specify the just transition policies in China, the EU and the US away from coal.

3.1 China

Ensuring “just transition” as one priority in energy and climate governance has attracted the attention of the highest levels of Chinese government leadership. At the Leaders Summit on Climate convened by the US President Biden in 2021, Chinese President Xi Jinping mentioned that China should “explore synergies between environmental protection and economic development, job creation and poverty eradication, and achieve social justice in the process of green transformation”.²⁴ Social justice is inextricably linked to equal employment opportunities for all in Chinese authorities’ philosophy. As Chinese Premier Li Keqiang stated in the *2021 Report on the Work of the Government*, “Employment is pivotal to people’s wellbeing”, and stabilizing employment and ensuring living standards (“稳就业，保民生”) is the focus of China’s current economic development (Li, 2021).

Chinese policymakers have long recognized that a decline in the coal industry would cause significant social and economic hardship, particularly in regions where coal is a major industry. Back at the beginning of the supply-side reform and cutting overcapacity directives in early 2016, the central government gave a number of proposals on employees’ placement. The *13th Five-Year Plan for Coal Industry Development (2016-2020)* points out the shortcomings of China’s coal industry, including “the large gap between per capita work efficiency of China and that of advanced coal-producing countries” and “defective closure and phase out mechanisms of coal mines, difficulties in employees’ resettlement, etc” (NDRC, National Energy Administration, 2016). According to

²⁴ Chinese President Xi Jinping’s speech at the Leaders Summit on Climate, http://www.gov.cn/xinwen/2021-04/22/content_5601508.htm

the Plan, the Ministry of Finance has set up a special fund of RMB 100 billion for “industrial enterprise restructuring” in the steel and coal industries. This special fund was partly allocated to local governments through fiscal transfers and partly used to directly support state-owned enterprises. Of the RMB 100 billion, 80% was allocated as a basic subsidy based on the amount of cutting overcapacity tasks (weighted at 50%), the number of workers to be resettled (weighted at 30%) and the degree of financial difficulties (weighted at 20%). The remaining 20% of the special funding will be used to reward regions or SOEs that exceed their targets (Ministry of Finance, 2016). To remove low-quality over-capacity fast, some of the funds were required to be subsidised directly to employees whose labour contracts had been terminated or internally retired due to the closure of coal mines or the shutdown of coal enterprises as financial compensation (NDRC, 2016), which was intended to alleviate social problems in the process of cutting overcapacity (China Coal, 2020).

The central government has set high expectations for the social impact of cutting overcapacity. In May 2016, when Chinese Premier Li Keqiang visited the Ministry of Human Resources and Social Security, he made it clear that “zero-employment households (零就业家庭)” would not be allowed to emerge as a result of cutting overcapacity.²⁵ Due to the bureaucratic target responsibility system and the top-down performance assessment system between the central government and local governments in China, the requirement from the State Council has put significant pressure on localities (Lu et al., 2021). Since 2017, the pace and quality of “employees’ resettlement and social stability” have been increasingly emphasised to make the cutting overcapacity campaign more socially affordable. Several measures are mentioned in the guidance on cutting overcapacity in key areas from 2018 to 2020 issued by ministries including NDRC, Ministry of Industry and Information Technology, National Energy Administration, etc., and in the practices by local governments in response to the requirement of the central government:

- Divert employees through multiple channels to positions that could be resettled (within or beyond the original enterprise) and subsidize enterprises that lay off employees relatively less;
- Encourage job transition, including holding special recruitment activities for workers to be resettled, providing vocational guidance, employment services and vocational training for workers to be diverted;
- Promote entrepreneurship, including providing entrepreneurship training for workers with the will to start their own businesses and utilize the local entrepreneurship incubation systems;
- Implement internal retirement for eligible workers and enterprises issue living expenses and pay the relevant social security, or formally retire workers if ages reach;
- Develop multi-channel funding to solve the problem of enterprises defaulting on social insurance premiums, promote timely payment of unemployment insurance benefits to eligible unemployed persons, strengthening the function of government-backed protection and ensuring the basics of employees’ livelihood;

²⁵ Statement by Chinese Premier Li Keqiang during his May 2016 tour of the Ministry of Human Services and Social Security, <http://www.nbd.com.cn/articles/2016-05-09/1003474.html>.

- Use public service jobs to help increase support for people with employment difficulties (e.g., “4050” group²⁶) and zero-employment households;
- Guide and promote the development of labour-intensive succession industries in resource-depleted areas;
- Prevent and resolve mass incidents in the process of cutting overcapacity. (NDRC, et al., 2017; NDRC, et al., 2018; 2019; 2020).

These resettlement policies have had some positive impacts on coal workers and communities. According to a survey of coal companies in Henan province, part of the workers who were from exited coal mines were resettled to more efficient large coal mines, or to large manufacturing plants such as Foxconn through a corporate partnership scheme, while a large number of workers also entered the tertiary sector with interest-free loans provided by enterprises to start their own businesses (Fu et al., 2017). However, some scholars argue that the past cutting overcapacity has not brought about significant unemployment and should be mostly attributed to the growth of the tertiary sector which effectively absorbed the surplus labour (Tang, et al., 2018).

There might be further challenges when the service sector becomes saturated in the future and the control of total energy consumption and energy use intensity (能效口控) continues. The policy framework regarding the re-employment of people working in energy-intensive industries including coal-related industries is still in the pipeline in the era of transitioning to carbon peaking by 2030 and carbon neutrality by 2060. The rapid growth of the renewable energy industry is expected to generate a large number of jobs. According to the IEA’s roadmap, the employment would increase by 3.6 million in clean energy supply in China by 2030 based on its Accelerated Transition Scenario (ATS), while decreasing employment in fossil fuel supply and fossil fuel power plants by 2.3 million, which means a nearly one million net increase in jobs (IEA, 2021d) (compared with Announced Pledges Scenario).²⁷ However, workers who exit the fossil fuel industry do not necessarily have the skill sets to go directly into the new energy industry. There are more real-world challenges that need to be solved, including not only the overall just transition strategy at the central level, but also the more specific just transition programs at the local level, which are more relevant to and more easily held accountable by stakeholders in each region.

3.2 The European Union

3.2.1 The Just Transition Mechanism

“Leaving no one behind” is a core concept standing in the ambitious European Green Deal, which aims to involve all sectors in all countries in the transition towards climate-neutrality, especially for those coal-reliant economies that are socially vulnerable to the EU emissions reduction targets. The Just Transition Mechanism is a framework built under this philosophy providing support to help regions that are most affected by the green transformation, namely those hard-to-decarbonize

²⁶ The “4050” group refers to women over 40 years old and men over 50 years old who have not yet reached retirement age or conditions but have difficulty getting employed, http://www.gov.cn/guowuyuan/content_2725941.htm<https://zh.wikipedia.org/wiki/%E5%9B%9B%E9%9B%B6%E4%BA%94%E9%9B%B6>.

²⁷ According to the International Energy Agency (IEA), – the Announced Pledges Scenario – reflects the enhanced targets China announced in 2020, and the Accelerated Transition Scenario refers to a faster transition.

regions to mitigate the socio-economic impact through mobilizing approximately EUR 55 billion during the period 2021-2027 (EC, 2021b).

The financing of the Just Transition Mechanism consists of three key parts as shown in Graph 2. As the first pillar of the Just Transition Mechanism, the Just Transition Fund is operated under the European Cohesion policy aiming to reduce the divergence between EU countries. This fund contains EUR 17.5 billion, of which EUR 7.5 billion comes from the EU budget for 2021-2027 and the remaining EUR 10 billion from the externally allocated revenues of the European Recovery Instrument, namely the NextGenerationEU, an instrument designed to counteract the socio-economic devastation of the EU brought about by Covid-19 (EC, 2021b). Meanwhile, member states could also transfer their national allocations under the European Regional Development Fund (ERDF) and the European Social Fund Plus (ESF+) as Just Transition Fund additional resources. A portion of the funds will be used for skill upgrading and retraining of workers, job-search assistance and “active inclusion of jobseekers programmes” (EC, 2021c).

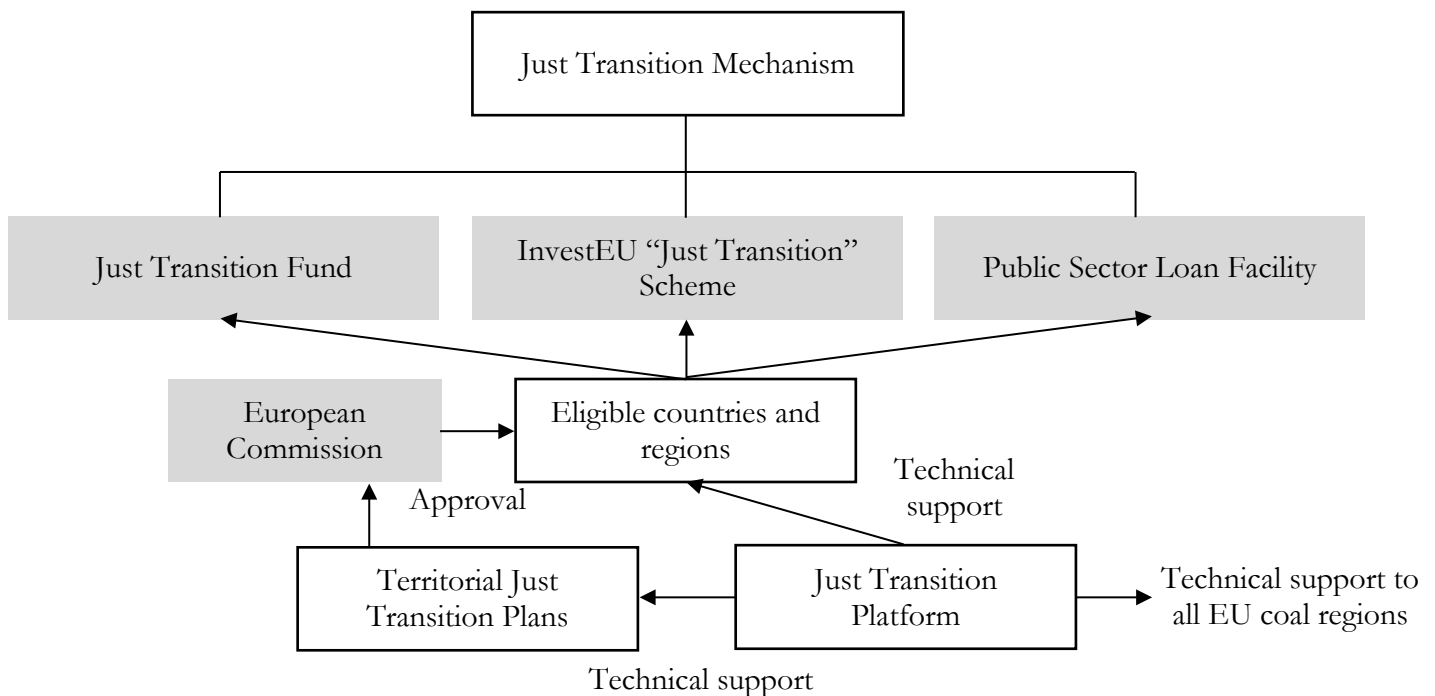
The Just Transition Scheme under InvestEU is the second pillar of the Mechanism. It would be seen as a leveraging agent for private and public capital to support a wider range of projects that have an approved just transition plan, including social infrastructure projects. Through the InvestEU financial products proposed by its implementing partners and the InvestEU Advisory Hub, which is a pipeline of projects, the InvestEU promotes financially feasible investments by private and public sector entities to help make a green and equitable transition in targeted regions (EC, 2021d). The third pillar, Public Sector Loan Facility, includes a grant of EUR 1.5 billion from the EU budget and a loan of EUR 10 billion from the European Investment Bank (EIB). This Facility looks to mobilise public investment of between EUR 25 and EUR 30 billion to invest in green, clean and just public infrastructure, including social infrastructure. The project may also integrate other financing partners in the future (EC, 2021e).

The Territorial Just Transition Plans help identify the eligible EU countries and regions for the support from the Just Transition Mechanism, and the eligibility will be evaluated by the European Commission based on the country’s national energy and climate strategies (EC, 2021b; World Resources Institute, 2021a). Meanwhile, the Just Transition Platform offers technical assistance to the EU countries in drafting the Territorial Just Transition Plans based on the status quo of specific regions (EC, 2021b). The Platform was developed on the foundation of the Initiative for Coal Regions in Transition, which has contributed to gather all coal-relevant stakeholders including governments at all levels from EU coal regions, enterprises, trade unions, nonprofits and academic, as a bottom-up dialogue mechanism (EC, 2021f; WRI, 2021a).

Currently, 100 regions have been identified as eligible for financial aid from the Just Transition Fund and are considered more vulnerable to the green transition. As of December 2021, the top recipients of the Just Transition Fund are Poland, Germany, the Czech Republic, Bulgaria and Romania (EC, 2021g). The Just Transition Mechanism could help EU countries that do not have enough capacity to make a green and just transition on their own to access investments leveraged from the public and private sectors, with access to science-based guidance. Even if some investments are not directly utilized with coal workers and coal communities, for them the transfer of capital and technology creates opportunities for local development and gains a public understanding of decarbonization (Strambo, 2020). However, while it is claimed that social infrastructure, vocational training for workers, etc. are included, the extent to which this mechanism is able to engage coal communities and coal industry workers, or, to what extent the mechanism is people-centered remains in question. There is criticism that much of the funding

being provided will go towards research and innovation rather than directly benefiting affected workers, and that trade unions are not being fully integrated into the design of the Just Transition system (Voet, 2020). This is more or less a departure from the original purpose of the mechanism, which is to provide a targeted labour and welfare policy (Marty, 2020). Though the mechanism clarifies the need for the EU countries to consult with all stakeholders when completing the Territorial Just Transition Plans, the mechanism does not ensure that the national government will make funds available to the regional governments most affected by coal phase out and to coal communities. Further, there is a lack of attention to the most vulnerable groups - the most disadvantaged sections of society and low-skilled workers - in the assessment indicators provided by the Territorial Just Transition Plans (Strambo, 2020).

Graph 2 – The Model of the EU’s Just Transition Mechanism



Source: European Commission – The Just Transition Mechanism: making sure no one is left behind, https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/finance-and-green-deal/just-transition-mechanism_en

3.2.2 The European Climate Pact

Another mechanism that could improve the situation of coal workers and coal communities at the EU level is the European Climate Pact, which aims to increase public participation in green transition and create an inclusive platform for all stakeholders. Raising awareness and taking action are the two dimensions of this Pact, with one area of focus for Action prioritized being Green skills, which mean the skills that are needed for a climate-neutral economy. In order to help workers up- and reskill, the Pact will launch a Pact for Skills which involves businesses, labour organisations, educational institutions, etc., to cooperate. It will also build a bridge between workers and organizations, e.g., Erasmus+ that provides vocational training opportunities, and

helps workers access the European Social Fund which aims to provide training for 5 million people on skills needed in the green economy and green recovery. There is also an interaction between the European Climate Pact and the Just Transition Mechanism, as the Pact will encourage stakeholders to utilize the Mechanism to help workers develop skills and get involved in a green economy, as well as create potential employment opportunities in targeted regions (EC, 2021h). This Pact helps to bring the voices of individuals and groups into policy making and defines environmental democracy (Dutu-Buzura, 2021), while this could also include the consultation with coal workers and coal communities. However, it is not designed for just transition, but for broader climate initiatives. This Pact goes beyond policy and law (Colli, 2021). While it offers a rosy vision for green skills training, it does not propose detailed measures to implement it in the meantime.

3.3 The United States

3.3.1 From Obama to Trump era

National efforts in the US to target a just transition away from coal began during the Obama administration when the number of workers in the US coal mining industry was rapidly declining. The Partnerships for Opportunity Workforce and Economic Revitalization (POWER) Initiative was launched in 2015 initially to help workers and communities relying on the coal industry adapt to the fast energy transition away from coal in the US through federal resources, especially in the Appalachian region (White House, 2015). As a down payment on the broader POWER+ program, which includes wider social welfare, economic recovery, and technology development (primarily CCUS) components, this initiative aims to help coal workers and coal communities from several perspectives: diversifying local business and industry; creating jobs in new and/or existing industries; attracting new sources of private and public investment; and providing a range of career services and skills training for jobs needed in the new economy (White House, 2015). From 2016 to 2019, Congress appropriated USD 50 million annually to the initiative through the Appalachian Regional Commission (ARC) which works on the economic development of the Appalachian region, including major coal states such as Kentucky, Missouri, West Virginia, etc. All the applications should also be submitted through the ARC. In recent years, POWER exists only as a funded program of the ARC (WRI, 2021b). The initiative has achieved considerable success. As of December 2021, the ARC has invested around USD 294.7 million in 369 projects throughout 354 coal-impacted communities with over 35,300 jobs created and USD 1.5 billion in additional private investment leveraged. In September 2021, the ARC made a new announcement of nearly USD 46.4 million for 57 projects in 184 counties to support coal-impacted communities in the Appalachian region to diversify the local economy (ARC, 2021).

The POWER Initiative's ability to secure congressional appropriations demonstrates a bipartisan interest in federal assistance to populations impacted by the energy transition in the US. However, though it was proposed at the federal level, the POWER Initiative is currently restricted to the Appalachian region and has not undergone an evaluation by the U.S. Government Accountability Office (GAO). More funds need to be mobilized, more regions need to be included for coal workers and communities in the energy transition (Cecire, 2019; WRI, 2021b).

The POWER Initiative provided an important foundation to a just transition and continued to work under the Trump administration. President Trump claimed to revive the coal industry and bring back coal mining jobs. His efforts, however, have been primarily on easing environmental review of coal projects, rather than on helping the transformation of coal communities inevitably

in decline. Further, President Trump's fiscal year 2018 budget cut the federal economic and workforce development programs which were set up to support coal communities impacted by the energy transition, which include the POWER Initiative. This went against his campaign promises to coal workers and coal communities (Bassett, Walsh, 2017; Partridge, Betz, 2017).

3.3.2 Just transition policies under Biden administration

Fulfilling the obligation to the fossil fuel workers and communities stands as one key element in *President Biden's Plan For A Clean Energy Revolution* since his election campaign. Among his campaign promises, he designed a benefits system for coal workers' health care and conceived a task force to help fossil energy-reliant communities access federal investments and mobilize private sector investments to complete the transition and create decent jobs, as well as provide training for workers.²⁸ Soon after the inauguration, on 27 January 2021, President Biden's *Executive Order on Tackling the Climate Crisis at Home and Abroad* lists a number of items to actively and purposefully assist coal workers and communities. The section *Empowering Workers Through Revitalizing Energy Communities* makes clear that the Biden administration will develop favorable policies targeting economic revitalization and investment in communities affected by the clean energy economy as well as job creation and social benefits securing, etc.²⁹

An Interagency Working Group (IWG) on Coal and Power Plant Communities and Economic Revitalization which is co-chaired by the Director of the National Economic Council and the National Climate Advisor, and administered by the Secretary of Energy, was established under the Executive Order. In April, the IWG released its *Initial Report to the President*, in which it identified "25 most impacted regions for coal-related declines" as "priority energy communities". According to the IWG, nearly USD 38 billion federal funding is available to the energy community (White House, 2021a).

Other plans and announcements are also mentioning empowerment of traditional energy communities and opportunity creation, including President Biden's *American Jobs Plan* (White House, 2021b), the Department of Energy's announcement to invest USD 109.5 Million to support energy jobs (Department of Energy, 2021), the Department of Commerce's Economic Development Administration (EDA)'s USD 300 million Coal Communities Commitment, and the Department of Agriculture's USD 167 million for energy communities (White House, 2021c). These plans and announcements are expected to be mutually bolstered with the IWG's workplan as well. Specifically, they all mentioned bringing employment opportunities through job creation "infrastructure projects", "pollution mitigation and environmental remediation", "next generation industries" as well as "securing benefits and opportunity for energy workers" by workforce training and empowerment, etc (White House, 2021a).

At the legislative level, In addition to the *Bipartisan Infrastructure Law* (White House, 2021d), which was passed by Congress, the ongoing "Build Back Better" legislation in Congress includes many initiatives to fund infrastructure and support communities impacted by the clean energy transition. In particular, the text of the legislation passed by the House Energy and Commerce Committee proposes USD 2 billion within a 10-year timeframe for low-carbon investments in the energy

²⁸ This is based on the Biden Plan For A Clean Energy Revolution And Environmental Justice, <https://joebiden.com/9-key-elements-of-joe-bidens-plan-for-a-clean-energy-revolution/>

²⁹ This is based on the Biden Plan For A Clean Energy Revolution And Environmental Justice, <https://joebiden.com/9-key-elements-of-joe-bidens-plan-for-a-clean-energy-revolution/>

community (Section 1706), and it contains retraining for workers and recovery for communities (Cahill, Pai, 2021). However, the specifics and numbers that will be in the final budget have not yet been determined. The “Build Back Better” framework, together with the *Bipartisan Infrastructure Law*, are expected to add an average of 1.5 million jobs per year over the next 10 years (White House, 2021d).

With Biden’s concurrent goals of reducing emissions by 50-52% compared with 2005 levels by 2030 and decarbonizing the power sector by 2035 (White House, 2021e), whether coal workers and communities will be the victims or the beneficiaries of clean energy jobs as Biden called for is still unknown in the short term. According to interviews, Biden’s infrastructure plan is gaining support from coal workers and communities, as they agreed on the plan to leave the mines in exchange for “green jobs” proposed in Biden’s policies (Daly, 2021; Egan, 2021). However, critics argue that the Biden administration’s outreach efforts may not be enough. A just transition requires a mechanism for sustained dialogue with diverse stakeholders, yet applications for funding have a very tight timeline for projects to be elaborated (Cahill, Pai, 2021). It is also a challenge for the Biden administration to make their transition economy more compelling. Each region that has relied on coal in the past needs a detailed assessment for the direction of economic transformation, and the determination for the new industry that could bring long-term sustainable development is complex. In addition, the income from “green jobs” is not necessarily more attractive than that from fossil fuels jobs, which can be a disincentive for workers and communities to embrace the green transition (Colman, Adragna, 2021).

4. Discussion and Conclusion

The different just transition policies away from coal in China, the EU, and the US show that there is often no one-size-fits-all just transition solution worldwide, and the policy-making of just transition often depends on politics, economic models, financing methods and social governance. There are some similarities and differences between the just transition policies of China, the EU and the US to move away from coal, as summarized in Table 6 and explained below.

Table 6 – The respective characteristics of just transition policies in China, the EU and the US

	China	European Union	United States
Philosophy in just transition	Stabilize employment and ensure living standards.	Leave no one behind,	Environmental justice.
Financial sources	Public sector-funded; “government-backed, market-supported”.	Public sector-funded and private sector mobilized; Funds from public and private sectors are both main pillars.	Public sector-funded and private sector mobilized; Funds from public and private sectors are both main pillars.
Detailed measures	Maintain the living standards of groups with hardship backed by the government financial support; Training for workers and entrepreneurship incubation;	Training for workers and entrepreneurship incubation; Industrial transformation and economic revival for coal regions.	Training for workers and entrepreneurship incubation; Industrial transformation and economic revival for coal regions; job creation by the climate strategy and green economy.

	Resettlement of workers to other positions; government ensuring employment through the partnership with enterprises and public service jobs; Promote local industrial transformation.		
Level of public participation	Follows a “top-down” approach and direct government-stakeholder dialogue is less mentioned.	Follows a “bottom-up” model and utilizes the EU’s Climate Pact to create a public participation platform.	Follows a “bottom-up” model and emphasizes the consultation with all stakeholders.

Putting people at the centre of the energy transition and ensuring inclusiveness and justice in the coal phase out have been mentioned in the central political leadership of all three blocs. As for China, in the campaign to cut overcapacity by 2020, Chinese Premier Li Keqiang referred to the need to avoid “zero-employment households”, and a number of guidance documents issued by ministries mentioned “employee resettlement” as a top priority. Following China’s proposal to become carbon neutral by 2060, Chinese President Xi Jinping emphasised the need to achieve equity and justice in the green transformation in 2021. The EU has established the pillars of just transition through the European Green Transition legislation. Under the mantra “leave no one behind”, the EU has developed the Just Transition Scheme as a resource tool and financing platform to ensure a just transition across all sectors in all EU member states. The European Climate Pact is also a voice for coal workers and communities negatively impacted by the energy transition. In the US, under the Biden administration, both the Bipartisan Infrastructure Law and “Build Back Better” legislation clarify just transition, environmental justice, and investing in communities. However, compared with the EU and the US, China does not yet have a clear framework or legislation to ensure a just transition in coal phase out or energy transition.

These three blocs have invested significant financial resources in people-centered coal retirement policies and a just transition. China has set up an RMB 100 billion special fund to support cutting overcapacity, with a focus on employee resettlement. The EU’s Just Transition Mechanism includes a EUR 17.5 billion Just Transition Fund, as well as EUR 13.3 billion in grants and loans through other channels. The US POWER Initiative and the federal government’s announced federal resources into communities affected by the energy transition since Biden took office have also been significant. However, the source of funding is different. China’s special fund of RMB 100 billion comes solely from the transfer payment of the Ministry of Finance. The EU’s Just Transition Mechanism is funded not only from the EU budget but also from the European Recovery Instrument, as well as from the European Regional Development Fund (ERDF) and the European Social Fund Plus (ESF+). Meanwhile, the Mechanism actively leverages public sector funds and private sector funds through InvestEU and the Public Sector Loan Facility, seeking to expand funding sources from multiple sources. The US POWER Initiative has also successfully leveraged more than USD 1.5 billion from private sector investment into the Appalachian region’s economy. However, as mentioned in the survey on the cutting overcapacity of coal plants in Henan, there were manufacturing companies that directly employed coal workers who had left the closed

coal mining capacity through partnerships. But China's just transition is more of a "government-backed, market-supported" model, with the government playing a leading role and the market playing a supporting role. This may be due to the fact that the Chinese government has a strong central fiscal system that can provide a backstop for the resettlement of workers during the cutting overcapacity process. It is worth noting that although multiple sources of financing to pay for unemployment insurance are mentioned in the policy document, the emphasis is still on the fundamental role of government finance. In the EU, however, the use of funds often requires cumbersome negotiations among member states. This might be why the final budget approved for the Just Transition Fund, EUR 17.5 billion, was much smaller than the EUR 40 billion budget in the European Commission's original proposal in January 2020 (the outbreak of Covid-19 is also one cause) (WRI, 2021a). Also, the U.S. budget for federal funds requires bipartisan approval in Congress. This is often politically difficult because the budget being discussed for coal communities might be dropped as other political issues are prioritized by the two major parties. The details of the policies to achieve a just transition in China, the EU, and the US are similar and different. All three blocs emphasized training for workers, especially for the skills needed for jobs in the new green economy. All three blocs also stressed support for entrepreneurship for coal workers. China stresses the government's role in ensuring stable employment, i.e., resettling workers to other possible positions; mobilizing enterprises throughout society to provide possible positions for workers leaving the coal industry, and the government itself provides a number of jobs of a public interest nature. This establishes an overall plan that is macro and tries to directly address the employment of industrial workers in a more flexible way. Such a plan would transmit pressure to local governments through China's upwardly accountable central-local relations and target responsibilities to develop locally tailored goals and solutions (Lu, et al., 2021). However, this approach is difficult to achieve in both the EU and the US, which have different political systems. Both the EU and the US mentioned accelerating clean industrial transformation and economic revival for coal communities and regions through green jobs. In particular, the US just transition plan places emphasis on the increased, higher-value jobs that a clean energy revolution can bring to workers in traditional fossil energy industries. In its 2017 coal and steel cutting overcapacity policy, China mentioned the development of labour-intensive industries in resource-depleted regions to take on labour. Yet support for the green economy was not stressed at this stage. Currently, China's industrial transformation program in the era of carbon peaking and carbon neutrality is not yet directly linked to the just transition. In addition, China's policies often place high attention on social security support for people in special hardship (e.g. 4050 group, zero-employment households, etc.), probably because China is still a developing country with relatively low per capita disposable income and a developing social welfare system compared to EU countries and the US.

The levels of public participation varied among the three blocs in the just transition away from coal. There is little mention of direct government-stakeholder dialogue in China's policies related to cutting overcapacity in the coal industry. The need for the government to prevent and defuse mass incidents in the process of de-capacitation, however, was highlighted in the relevant policies. Although some interviews mentioned a series of consultations by coal companies in understanding workers' future intentions for resettlement, a public participation mechanism for just transition has not yet been established. This may be due to the fact that China's energy and climate governance model favors a "top-down" approach (Lu, et al., 2021). In contrast, both the EU and the US emphasize the values of environmental democracy and environmental justice and have

adopted some form of “bottom-up” participation in energy and climate governance. The EU’s Climate Pact legislates legal ways for citizens to participate, and the US Interagency Working Group (IWG) on Coal and Power Plant Communities and Economic Revitalization has conducted lengthy communications with stakeholders in various states in the way of workshops.

This paper presents some of the current status of the coal sector in China, the EU, the US, and their just transition policies away from coal, with the aim of illustrating the complexity of the issue of just transition and explaining the reasons for the differences between the three blocs. However, the current energy and climate goals and just transition policies of China, the EU and the US are also evolving and require our continued attention. The significance of comparing these three blocs is also to demonstrate that with the deepening of the energy transition, a just transition has become imminent and different countries/regions need to adopt localized policies as soon as possible, drawing on real-life practices.

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Fondazione Eni Enrico Mattei

Corso Magenta 63, Milano - Italia

Tel. +39 02.520.36934

Fax. +39.02.520.36946

E-mail: letter@feem.it

www.feem.it

