



Perspective

Just transitions: Histories and futures in a post-COVID world

Matthew S. Henry^a, Morgan D. Bazilian^{b,*}, Chris Markuson^c^a The University of Wyoming, WY, USA^b The Colorado School of Mines, CO, USA^c The BlueGreen Alliance, CO, USA

ARTICLE INFO

Keywords:

Just transitions
Energy transitions
Socio-economics

ABSTRACT

The energy landscape is changing dramatically. Communities are being impacted in different ways. Positive impacts include reductions in air pollution and new tax revenues from renewables. Negative impacts include lost jobs and foregone tax revenues after closure of large fossil fuels generation facilities and coal mines. The contours of this transition have been further altered by recent events such as the global oil market crash and the COVID-19 pandemic. While economic and social issues can be addressed through thoughtful policy design, the pace of change, and the extent to which communities have a say in what comes next, matter. Though the technical issues of transitions are well-researched, the socio-economic aspects of the energy transition remain both emergent and essential to an equitable transition to a low-carbon energy system. This article provides an overview of the history and current status of just transitions.

1. Introduction

The energy landscape is changing dramatically. There are multiple energy “transitions” ongoing simultaneously including, *inter alia*: significant cost declines in wind, solar and battery storage; the closing of large quantities of coal capacity; new trade patterns for liquefied natural gas (LNG); and demand growth in Asian economies. The contours of this transition have been rendered further uncertain by the twin crises of the COVID-19 pandemic and the global oil market crash in the first half of 2020. While the technical issues of these transitions are well-researched [1], the social aspects of the energy transition remain both emergent and essential to a successful outcome. Communities are being impacted in different ways. Positive impacts include reductions in air pollution and new tax revenues from renewables. However, negative impacts can include lost jobs and tax revenues after closure of large fossil fuel generation facilities and coal mines as well as strains on public revenue associated with mine reclamation efforts. While economic and social issues can be addressed through thoughtful policy design, the pace of change, and the extent to which communities have a say in what comes next, matter.

In the United States, the Obama Administration addressed the issue of potential job and revenue losses in its POWER + Plan several years ago. A 2019 Bill in Colorado, HB19-1314, created a new institution called the “Just Transition Office” within the Department of Labor and Employment. While its focus is in coal plant and mine closures, the

institutional framework could be applied in the future to other aspects of the energy transition [2]. Present challenges including the 2020 oil crash and the COVID-19 pandemic have accelerated job losses in other parts of the energy sector, especially in oil and gas [3]. Whether these will remain permanent features of the energy landscape is not clear, but some level of consolidation and job loss was occurring prior to the virus’ spread [4]. The need for a “just transition,” a managed shift toward a low-carbon energy system that prioritizes secure, family-sustaining jobs and healthy communities, is urgent given emergent risk multipliers for those on the front lines of a shifting energy and labor landscape. We consider the roots of the notion of just transitions as they grew out of labor and environmental justice movements and examine existing institutions, processes, and policy initiatives that presently support the implementation of a just transition.

2. Roots

Labor and environmental justice organizations have already provided many tools and theories, examined below, that can be applied to ensure that the current energy transition is equitable. To better understand these tools and theories, however, it is necessary to consider the origins of just transition frameworks. The concept of a just transition originated with the U.S. labor movement of the 1970 s and broadened as labor organizations forged alliances with environmental justice groups starting in the 1990 s. Initially the concept emerged in

* Corresponding author.

E-mail address: mbazilian@mines.edu (M.D. Bazilian).<https://doi.org/10.1016/j.erss.2020.101668>

Received 2 May 2020; Received in revised form 12 June 2020; Accepted 17 June 2020

Available online 10 July 2020

2214-6296/© 2020 Elsevier Ltd. All rights reserved.

response to increased regulation of pollutive industries in the wake of the National Environmental Policy Act and the establishment of federal Superfund law in the U.S. Labor unions like the Oil, Chemical, and Atomic Workers (OCAW), long vocal about the environmental impacts of their work, faced widespread job losses despite heavily funded cleanup efforts at contaminated work sites. Led by OCAW and others, workers demanded a “superfund for workers” and a “superfund for communities” that included not only worker retraining and community support, but also broader efforts to plan and design a more environmentally-friendly approach to industrial production [5]. Current labor organizations in the U.S. that advocate for just transition frameworks include the BlueGreen Alliance, the Labor Network for Sustainability, and the Just Transition Alliance.

Just transition frameworks have been integrated into political discourse in the European Union since at least the early 2000 s, arguably mirroring the belated focus on environmental justice concerns at the policy level relative to the United States. The notion of environmental justice originated in the U.S. in the mid-1980 s within the context of a broader movement for racial equality and increasing recognition that low-income communities and communities of color were disproportionately impacted by toxic waste dumping and industrial siting. However, environmental justice didn’t enter into meaningful policy discussions in the EU until the early 2000 s [6]. Global labor organizations in the EU, on the other hand, have been advocating for just transition principles, initially under alternative designations like sustainable development and ‘green jobs,’ since the late 1990 s. Organizations like the International Labour Organization (ILO) and the International Trade Union Confederation (ITUC) have long been involved in global environmental negotiations and have become leaders on advocacy for a range of objectives in support of a just transition [7].

In recent years, energy transition research in the U.S. and globally has expanded to explore a range of economic and policy mechanisms necessary to achieve a just transition. Some have suggested that fossil fuel divestment presents a viable way to center issues of energy justice upstream, prompting the consideration of injustices related to supply-side analysis and decision-making in various energy sectors [8]. Just transition frameworks have been explored through the lens of political economy, advancing the notion that beyond worker protections, addressing energy access and poverty and adopting climate justice goals are necessary to ensure transition is equitable [9]. Just transition frameworks have also been leveraged to argue for the need for a socially equitable approach to sustainable design in a post-carbon future [10]. Likewise, there have been efforts to map and align environmental policy goals with anticipated levels of investment in renewables in conjunction with the implementation of adequate worker support systems and recommended public policy [11]. *Energy Research and Social Science* has had numerous articles touching on various aspects of a just energy transition. Tvinnereim et al. (2017) look at the issues from a national perspective in Norway, while Bireselioglu et al. (2020) consider the wider European issues for individuals and collectives [12,13]. Johnstone et al. (2020) explore some of the non-technical issues of energy transitions [14]. Crowe and Li (2020) explore the issues of just transitions in certain US states for both coal and solar [15]. Sovacool and Brisbois (2019) explore the role of “elite power” in these transitions, while Schwarz (2020) considered the role of citizen power as did Thombs (2019) [16-18]. Both Bayulgen (2020) and Seidl (2019) looked at socio-economic aspects of specific energy transitions [19,20]. Prinz and Pegels (2018) considered the role of labor organizations in energy transitions, and Oselik (2019) used an advocacy coalition framework [21,22]. Li and Strachan (2019) used socio-economic modelling to explore transitions, and Hess (2019) viewed the issues through a local democracy lens [23,24].

Within environmental justice research and especially advocacy circles, the concept of a just transition is viewed more expansively to include not only concerns about energy and jobs, but also of sustainability and equity. In this context, just transition frameworks encompass a

range of issues like food justice, green gentrification, and energy sovereignty [25]. Organizations in the United States like the Just Transition Alliance (JTA) define a just transition that emphasizes the co-existence of a healthy environment and a strong economy, and that processes and practices necessary to achieve these goals should be inclusive, equitable, and community-driven. The JTA emerged in the mid-1990s out of a formalized Campaign for a Just Transition led by a coalition of labor and environmental justice groups, many rooted in low-income communities and communities of color in opposition to North American Free Trade Agreement (NAFTA), which was viewed as weak on environmental and labor protections [26]. The JTA has long prioritized issues beyond the workplace to include the regulation of chemical use in manufacturing, workplace safety best practices, expanded job opportunities and the development of innovative income and taxation structures in communities impacted by the closure of pollutive industries, public health advocacy, and more. The JTA has also supported labour-friendly climate policies nationally and internationally and argued for the incorporation of just transition language into global environmental discourse.

The Climate Just Alliance (CJA) takes a more social justice-centric approach to just transition principles, emphasizing the importance of countering structural inequalities. The CJA defines a just transition as set of principles “that build economic and political power to shift from an extractive economy to a regenerative economy.” Key to these processes is an emphasis on “redressing past harms and creating new relationships of power for the future through reparations” [27]. In this framework, policy paths necessary to ensure an equitable transition are highly contingent on geographical and cultural context and require community buy-in, agency, and empowerment. CJA membership includes a diverse range of organizations, from the Energy Justice Network and the Alliance for Appalachia to the Indigenous Environmental Network and the National Family Farm Coalition. The group outlines eight just transition principles, that emphasize that a just transition “must actively work against and transform historic social inequities based on race, class, gender, immigrant status, and other forms of oppression” [27]. The CJA cites these efforts as critical for working toward a just transition across diverse geographies in the United States and beyond, from communities dependent on fossil fuel extraction to those on the frontlines of climate change.

3. A global response

Just transition principles have been increasingly integrated into national and international policy reports and agreements, offering reason for optimism about near-future implementation. In 2015, the ITUC put out a document on climate justice related to changing jobs under a shift to a low-carbon economy [28]. The United Nations Conference on Sustainable Development (Rio + 20) included just transition language in a resulting political outcome document “The Future We Want” [29]. Related, in 2013, the ILO approved a related resolution around green jobs and sustainability. The International Institute for Sustainable Development (IISD) pulled together several examples of programs around the world that relate to just transitions [30]. A blog by the World Resources Institute (WRI) cites several key aspects of a just transition approach, including:

- Income support for workers during the full duration of transition
- Local economic development tools for affected communities
- Realistic training/retraining programs that lead to decent work
- Knowledge sharing—the adoption of best practices from other jurisdictions
- A framework to support labour standards and collective bargaining
- A sectoral approach customized to regions and work processes [31]

In 2018, Spain reached an agreement with coal workers around the changing energy landscape [32]. In 2017, the Organisation for

Economic Co-operation and Development (OECD) put out a major report on just transitions written by the Just Transitions Centre [33]. At the United Nations Framework Convention on Climate Change COP24 there was considerable effort spent on just transitions [34]. Likewise, the preamble to the 2016 Paris Climate Agreement featured just transition language, as did House Resolution 109 calling for implementation of a Green New Deal introduced in the United States Congress in early 2019 [35].

The concept of a just transition, while studied extensively, has been difficult to implement and actively resisted globally [36]. However, multiple initiatives are emerging with financial backing and political momentum. The State of Colorado's creation of its Just Transition Office is the first effort at a statewide scale in the United States. Poland presented a Solidarity and Just Transition Silesia Declaration in 2018 [37]. The European Commission proposed developed the Coal Regions in Transition (CRiT) platform in 2019, followed by a new Just Transition Mechanism in 2020 [38].

Common to many just transition studies and programs, whether they prioritize economic, political, or environmental justice viewpoints, is recognition that efforts require industry worker, resident, local government, and business community participation to structure efforts that address regional social and economic needs [39]. Europe's Second Forum of Mayors on Just Transition laid out specific expectations that local communities and leaders be included in all transition processes [40]. This sentiment was echoed as a fundamental desire in 2020 community meetings in Northwest Colorado with the State's Just Transition Office [41].

4. Action

Each Just Transition program grapples with financing the planning and implementation of efforts—especially necessary worker and social supports. Although locally driven initiatives are emerging as preferred practices, sufficient revenues typically are not available within the local rural economies most impacted by pending loss of extractive industry. European efforts mainly rely upon establishment of massive, multi-governmental European Union funding initiatives and mechanisms, such as the European Commission's Structural Reform Support Service, to channel funding to programs, workers and communities [42]. In the United States, initiatives contemplate layered governmental funding from federal, state and regional agencies, combined with available non-governmental philanthropic and private industry funding [43]. Examples include the Just Transition Fund and the Appalachian Regional Commission. Strategic alignment and timing deployment of funding for initiatives, in concert with phases of transition in regions, efficiently maximizes investments, as different funding needs exist throughout transition life cycles.

The Just Transition Centre, established by the ITUC, outlines three main phases for transition:

1. Engagement phase – community goals development, economic development planning, creation of policies in support of transition efforts, establishment of financial programs, economic impact analysis
2. Planning phase – retraining of workers, invest in economic development, scaled implementation of emissions reductions and investments in renewables, investment in community energy savings
3. Enactment phase – enact worker and social protections programs, implement wide-ranging apprenticeship and entrepreneurship training, repurpose and remediate properties, invest in regional green technology research and development [44]

Deployment of funding for each phase of transition from parties, including utilities and mining companies that allows sufficient planning and development of resources is crucial for successful transitions. In order to allow this to happen, setting fixed, agreed-upon timelines for

coal phase-out is required [45]. Fixed timelines also give workers abilities to plan for their future and avoid the severe economic repercussions of sudden mass layoffs.

5. Conclusion

While the just transition concept has gained significant traction in economic and policy circles, considerable challenges exist with regards to implementation. Obvious obstacles include the shifting and contingent dynamics of energy transitions across disparate geographical, political, and economic localities. The fact that there is no universally agreed-upon definition of or framework for just transitions presents further challenges. While in labor circles the notion of a just transition evokes solutions such as worker retraining, targeted economic development plans, and public and private investment, environmental and climate justice organizations approach just transitions more holistically and tend to emphasize support for community-level engagement and participatory governance. While there is significant overlap amongst these organizations regarding issues like sustainability and green jobs, achieving alignment and compromise will remain a necessary and ongoing task. Regional idiosyncrasies prevent further challenges. For example, solar is likely better suited than wind to replace local coal mining jobs but is not available or viable everywhere [46]. As such, it is critically important to document processes, policies, and outcomes within and across organizations that have adopted just transition principles. Coalition-building and information-sharing will be critical to compare results and leverage resources locally, nationally, and globally. Likewise, as evidenced by existing just transition initiatives, community-centric, co-productive approaches to policy design and implementation in regions most impacted by the energy transition must be emphasized in tandem with other government and industry stakeholder needs.

Recent ongoing events such as the COVID-19 pandemic and the global oil crash both underscore the urgency of adopting and implementing just transition policies. Reduced demand for electricity has had an acute impact on coal, with analysts predicting the industry, unable to compete with cheaper renewables, will likely not recover post-pandemic [47]. As a result, the COVID-19 crisis represents a unique opportunity to adopt just transition principles into community and economic recovery efforts. To be sure, challenges exist. For example, the pandemic has resulted in the loss of over half a million clean energy jobs, halting momentum in sectors like solar and wind [48]. While the International Energy Agency has predicted a recovery in renewables following the early stages of the pandemic, uncertainty remains [49]. However, there is tremendous upside in incorporating just transition policies into recovery efforts at the state and federal levels. In the U.S., massive stimulus bills such as the CARES Act represent an opportunity for parallel investments in clean energy and green jobs programs to support a just recovery and bolster economic and social resilience. Possible measures include targeted support for renewable energy projects, weatherization programs, building retrofits, electric vehicle manufacturing, and green job creation [50]. The potential for combining energy transition and recovery initiatives is likewise accompanied by the usual caveats with regard to funding needs, program implementation, and community participation. However, because just transition frameworks emerged out of diverse organizational coalitions and have evolved over the last few decades to respond to shifting social, environmental, and energy realities, they remain essential for supporting a shift to a low-carbon energy system that prioritizes sustainability and social and economic equity.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to

influence the work reported in this paper.

References

- [1] See e.g., A. Grubler, Energy transitions research: Insights and cautionary tales, *Energy Policy* 50 (2012), pp. 8–16, doi: 10.1016/j.enpol.2012.02.070; A. G. Dagnachew, A.F. Hof, P.L. Lucas, D.P. van Vuuren, 2019. Insight into energy scenarios: A comparison of key transition indicators of 2° C scenarios (2019), https://www.pbl.nl/sites/default/files/downloads/pbl-2019-insight-into-energy-scenarios_3686.pdf.
- [2] H.B. 19-1314, 2019 First Reg. Sess., 72nd General Assembly, (Col. 2019) https://leg.colorado.gov/sites/default/files/2019a_1314_signed.pdf.
- [3] See e.g., B. Handler, M. Bazilian, Economic impacts of the 2020 oil market crash, *World Oil* 241 (5) (2020), <https://www.worldoil.com/magazine/2020/may-2020/features/economic-impacts-of-the-2020-oil-market-crash>.
- [4] R. Barbosa, G. Bresciani, P. Graham, S. Nyquist, K. Yanosek, Oil and gas after COVID-19: The day of reckoning or a new age of opportunity? McKinsey & Co., 15 May 2020, <https://www.mckinsey.com/industries/oil-and-gas/our-insights/oil-and-gas-after-covid-19-the-day-of-reckoning-or-a-new-age-of-opportunity>.
- [5] See B. Commoner, Making Peace with the Planet, Pantheon Books (New York), 1990; L. Leopold, The man who hated work but loved labor: The life and times of Tony Mazzochi, Chelsea Green Publishing Co. (Vermont), 2007; T. Mazzochi, An answer to the jobs-environment conflict?, *Green Left* 114 (1993), <https://www.greenleft.org.au/content/answer-jobs-environment-conflict>.
- [6] É. Laurent, Issues in environmental justice within the European Union, *Ecol. Econ.* 70 (11) (2011) 1846–1853, <https://doi.org/10.1016/j.ecolecon.2011.06.025>.
- [7] D. Stevis, R. Felli, Global labour unions and just transition to a green economy, *Int. Environ. Agreements* 15 (2015) 29–43, <https://doi.org/10.1007/s10784-014-9266-1>.
- [8] N. Healy, J. Barry, Politicizing energy justice and energy system transitions: Fossil fuel divestment and a 'just transition', *Energy Policy* 108 (2017) 451–459, <https://doi.org/10.1016/j.enpol.2017.06.014>.
- [9] S. Jasanoff, Just transitions: A humble approach to global energy futures, *Energy Res. Soc. Sci.* 35 (2018) 11–14, <https://doi.org/10.1016/j.erss.2017.11.025>;
- [10] P. Newell, D. Mulvaney, The political economy of the 'just transition', *Geograph. J.* 179 (2) (2013) 132–140, <https://doi.org/10.1111/geoj.12008>.
- [11] D. White, Just Transitions/Design for Transitions: Preliminary Notes on a Design Politics for a Green New Deal, *Cap. Nat. Soc.* (2019), <https://doi.org/10.1080/10455752.2017.1393093>.
- [12] R. Pollin, J. Wicks-Lin, S. Chakraborty, and T. Hansen, A Green Growth Program for Colorado, PERI Research Paper, Amherst, MA (2019), <https://www.peri.umass.edu/publication/item/1168-a-green-growth-program-for-colorado>.
- [13] E. Tvinnerheim, O. Martin Lægred, K. Fløttum, Who cares about Norway's energy transition? A survey experiment about citizen associations and petroleum, *Energy Res. Soc. Sci.* 62 (2020).
- [14] M. Efe Biresellioglu, M. Hakan Demir, M. Demirbag Kaplan, B. Solak, Individuals, collectives, and energy transition: Analysing the motivators and barriers of European decarbonisation, *Energy Res. Soc. Sci.* 66 (2020).
- [15] P. Johnstone, K.S. Rogge, P. Kivimaa, C.F. Fratini, E. Primmer, A. Stirling, Waves of disruption in clean energy transitions: Sociotechnical dimensions of system disruption in Germany and the United Kingdom, *Energy Res. Soc. Sci.* 59 (2020).
- [16] J.A. Crowe, R. Li, Is the just transition socially accepted? Energy history, place, and support for coal and solar in Illinois, Texas, and Vermont, *Energy Res. Soc. Sci.* 59 (2020).
- [17] B.K. Sovacool, M. Brisbois, Elite power in low-carbon transitions: A critical and interdisciplinary review, *Energy Res. Social Sci.* 57 (2019).
- [18] L. Schwarz, Empowered but powerless? Reassessing the citizens' power dynamics of the German energy transition, *Energy Res. Social Sci.* 63 (2020).
- [19] R.P. Thombs, When democracy meets energy transitions: A typology of social power and energy system scale, *Energy Res. Social Sci.* 52 (2019).
- [20] O. Bayulgen, Localizing the energy transition: Town-level political and socio-economic drivers of clean energy in the United States, *Energy Res. Social Sci.* 62 (2020).
- [21] R. Seidl, T. von Wirth, P. Krütli, Social acceptance of distributed energy systems in Swiss, German, and Austrian energy transitions, *Energy Res. Social Sci.* 54 (2019).
- [22] L. Prinz, A. Pegels, The role of labour power in sustainability transitions: Insights from comparative political economy on Germany's electricity transition, *Energy Res. Social Sci.* 41 (2018).
- [23] P. Oedlík, K. Svobodová, M. Hendrychová, L. Lehotský, J. Everingham, S. Ali, J. Badera, A. Lechner, A contested transition toward a coal-free future: Advocacy coalitions and coal policy in the Czech Republic, *Energy Res. Social Sci.* 58 (2019).
- [24] F.G.N. Li, N. Strachan, Take me to your leader: Using socio-technical energy transitions (STET) modelling to explore the role of actors in decarbonisation pathways, *Energy Res. Social Sci.* 51 (2019).
- [25] D.J. Hess, Coalitions, framing, and the politics of energy transitions: Local democracy and community choice in California, *Energy Res. Social Sci.* 50 (2019).
- [26] See J. Sze and E. Yampierre, in W. Curran and T. Hamilton (Eds.), *Just transition and Just Green Enough: Climate justice, economic development, and community resilience*, *Just Green Enough: Urban Development and Environmental Gentrification*, Routledge, New York (2018), pp. 61–73; G. Di Chiro, L. Rigell, Situating Sustainability against Displacement, in J. Sze (Ed.), *Sustainability: Approaches to Environmental Justice and Social Power*, NYU Press, New York (2018), pp. 76–101.
- [27] See J. Adamson, Campaign for a Just Transition, in S. Oboler and D. Gonzalez (Eds.), *The Oxford Encyclopedia of Latinos and Latinas in the United States*, Oxford Uni. Press, Oxford, (2005) 2011 and Just Transition Alliance, What is a Just Transition? (accessed 1 May 2020), <http://jtalliance.org/what-is-just-transition/>.
- [28] Climate Justice Alliance, Just Transition: A Framework for Change (accessed 1 May 2020), <https://climatejusticealliance.org/just-transition/>.
- [29] ITUC, Climate Justice: There are no jobs on a dead planet, Brussels: International Trade Union Confederation (2015) https://www.ituc-csi.org/IMG/pdf/ituc_frontlines_climate_change_report_en.pdf.
- [30] ILO, Resolution concerning sustainable development, decent work, and green jobs, Geneva: International Labour Organization (2013), https://www.ilo.org/wcmsp5/groups/public/@ed_norm/@relconf/documents/meetingdocument/wcms_223785.pdf.
- [31] P. Gass, In Search of Just Transition, International Institute for Sustainable Development, 2019 (accessed 1 May 2020), <https://www.iisd.org/blog/just-transition-examples>.
- [32] J. Cartwright, Toward a Just Transition, World Resources Institute (accessed 1 May 2020), <https://www.wri.org/climate/expert-perspective/toward-just-transition>.
- [33] IndustriAll, Spanish coal unions with landmark Just Transition deal (2018), <http://www.industrialunion.org/spanish-coal-unions-win-landmark-just-transition-deal>.
- [34] OECD, Just Transition: A Report for the OECD, Organization for Economic Cooperation and Development, <https://www.oecd.org/environment/cc/g20-climate/collapsecontents/Just-Transition-Centre-report-just-transition.pdf>.
- [35] M. James, A Just Transition – or a transition, but only just?, *Energy Post*, 26 Nov. 2018 (accessed 1 May 2020), <https://energypost.eu/just-transition-or-transition-but-only-just/>.
- [36] UNFCCC, Adoption of the Paris Agreement, FCC/CP/L.9/Rev. 1 (2015), <https://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf>; A. Ocasio-Cortez, H.Res. 109: Recognizing the duty of the Federal Government to create a Green New Deal (2019), <https://www.congress.gov/bill/116th-congress/house-resolution/109/text>.
- [37] Rosa Luxemburg Stiftung – Brussels Office, Ideological divisions in the 'Yellow Vest' movement, <https://www.rosalux.eu/kontext/controllers/document.php/362.8/7/c568df.pdf>.
- [38] Solidarity and Just Transition Silesia Declaration, UNCCC, COP24 (2018), https://cop24.gov.pl/fileadmin/user_upload/Solidarity_and_Just_Transition_Silesia_Declaration_2_.pdf.
- [39] European Commission, Coal regions in transition (accessed 1 May 2020), https://ec.europa.eu/energy/topics/oil-gas-and-coal/EU-coal-regions/coal-regions-transition_en; European Commission, Financing the green transition: The European Green Deal Investment Plan and Just Transition Mechanism, 14 Jan. 2020 (accessed 2 May 2020), https://ec.europa.eu/commission/presscorner/detail/en/ip_20_17.
- [40] P. Oei, H. Brauers, P. Herpich, Lessons from Germany's hard coal mining phase-out: policies and transition from 1950–2018, *Clim. Policy* (2019), <https://doi.org/10.1080/14693062.2019.1688636>.
- [41] Forum of Mayors on Just Transition, Declaration of Mayors on Just Transition (2019), https://regionsbeyondcoal.eu/wp-content/uploads/2019/10/191014_mayors_declaration_on_a_just_transition.pdf.
- [42] S. Johnson, Will Just Transition be a 'just' transition?, *Craig Daily Press*, 5 Mar. 2020 (accessed 2 May 2020), <https://www.craigdailynews.com/news/will-just-transition-be-a-just-transition/>.
- [43] TRACER, Best practice on financing the transition from coal in European coal regions, EUREC (2020), https://tracer-h2020.eu/wp-content/uploads/2020/01/D2_3-Best-practice-in-financing-coal-transition_final.pdf.
- [44] Arabella Advisors, The JPB Foundation, and Windward Fund, How Donors Can Achieve Outsized Impact on the Environment With Non-Ended Funds (2020), <https://www.windwardfund.org/wp-content/uploads/2019/09/How-Donors-Can-Achieve-Outsized-Impact-on-the-Environment.pdf>.
- [45] Just Transition Centre, Just Transition: A Business Guide (2018), https://www.ituc-csi.org/IMG/pdf/just_transition_-_a_business_guide.pdf.
- [46] World Wildlife Fund, Just Transition to climate neutrality (2020), <https://www.wwf.de/fileadmin/fm-wwf/Publikationen-PDF/WWF-Just-Transition-to-Climate-Neutrality.pdf>.
- [47] S. Pai, H. Zerriffi, J. Jewell, J. Pathak, Solar has greater techno-economic resource suitability than wind for replacing coal mining jobs, *Environ. Res. Lett.* 15 (3) (2020), <https://doi.org/10.1088/1748-9326/ab6c6d>.
- [48] J. Watts and J. Ambrose, Coal industry will never recover after coronavirus pandemic, experts say, *The Guardian*, 17 May 2020, Accessed 11 June 2020, <https://www.theguardian.com/environment/2020/may/17/coal-industry-will-never-recover-after-coronavirus-pandemic-say-experts>.
- [49] J. R. Martin, COVID-19: Currency fallout to 'wipe out' global momentum of PV, wind in 2020, *PV-Tech*, 30 Mar. 2020, Accessed 11 June 2020, <https://www.pv-tech.org/news/covid-19-currency-fallout-to-wipe-out-global-momentum-of-pv-wind-in-2020>.
- [50] D. Blackmon, How COVID-19 is hindering the energy transition, *Forbes*, 14 May 2020, Accessed 11 June 2020, <https://www.forbes.com/sites/davidblackmon/2020/05/14/how-covid-19-is-hindering-the-energy-transition/#4ba97283de49>.
- [51] See e.g., J. Rhodes and M. Bazilian, How to make the economic stimulus great, *Forbes*, 24 Mar 2020, <https://www.forbes.com/sites/joshuarhodes/2020/03/24/how-to-make-the-economic-stimulus-great/#4a61fd8a5a15> and K. Aronoff, A golden opportunity for a green stimulus, *The New Republic*, 13 Mar 2020, <https://newrepublic.com/article/156903/golden-opportunity-green-stimulus>.