

2023

Ethical and Strategic Issues in Decarbonization Policy

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Roger E. Meiners & Andrew P. Morriss, *Ethical and Strategic Issues in Decarbonization Policy*, 39 GA. ST. U. L. REV. 969 (2023).

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ETHICAL AND STRATEGIC ISSUES IN DECARBONIZATION POLICY

Roger E. Meiners* & Andrew P. Morriss**

ABSTRACT

Policies that force non-fossil fuel energy result in increased reliance on the rapid development and deployment of batteries and other technologies to meet decarbonization goals set by the United States and other industrialized economies. This Article focuses on batteries, noting that key minerals come from corrupt or hostile countries. Many key finished products come from China, thereby making the U.S. and the European Union reliant on an autocratic regime. Using cobalt as an example, the Article considers its production and the U.S.'s unwillingness to shoulder its share of the environmental burden of mineral extraction or refining. Further, the U.S. is increasingly reliant on China for inputs with no good substitutes, raising questions about the desirability of such economic integration. Efforts to spur decarbonization more effectively are warranted and may be nudged along by the Inflation Reduction Act of 2022.

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INTRODUCTION

The Russian invasion of Ukraine revealed European nations' dangerous dependence on Russian supplies of natural gas. When Russia reduced supplies of natural gas sold to European countries,¹ the price spiked to historic levels, inflicting economic damage on their economies and peoples as well as on the broader world economy.² European countries switched to natural gas in lieu of coal to reduce carbon emissions but tied themselves to Russian gas by building pipelines to Russia instead of increasing domestic exploration or building liquefied natural gas terminals.³ When natural gas became suddenly scarce, countries fired up retired coal plants⁴ and kept

1. *German Economy Minister Says 'Bitter Reality' Is Russia Will Not Resume Gas Supply*, REUTERS (Aug. 29, 2022, 2:05 PM), <https://www.reuters.com/business/energy/german-economy-minister-says-bitter-reality-is-russia-will-not-resume-gas-supply-2022-08-29/> [<https://perma.cc/459L-UYEM>]. The subsequent destruction of a major undersea pipeline ensured the flow of gas could not return to previous levels. See Paul Carrel & Stine Jacobsen, *EU Vows to Protect Energy Network After 'Sabotage' of Russian Gas Pipeline*, REUTERS (Sept. 28, 2022, 11:16 PM), <https://www.reuters.com/business/energy/mystery-gas-leaks-hit-major-russian-undersea-gas-pipelines-europe-2022-09-27/> [<https://perma.cc/B9QC-KJW3>].

2. In August 2022, the price of natural gas was several times the highest price ever experienced. See *Global Price of Natural Gas, EU*, FED. RSRV. ECON. DATA, <https://fred.stlouisfed.org/series/PNGASEUUSD> [<https://perma.cc/QCK9-PYM2>] (Apr. 21, 2023). The price later fell. *Id.*

3. See Nikos Tsafos, *The Complex Relationship Between Coal and Gas in Europe*, CTR. FOR STRATEGIC & INT'L STUD. (Feb. 13, 2020), <https://www.csis.org/blogs/energy-headlines-versus-trendlines/complex-relationship-between-coal-and-gas-europe> [<https://perma.cc/ZD8Q-AZ8Y>]; RICHARD J. ANDERSON, GEORGE C. MARSHALL EUR. CTR. FOR SEC. STUD., *EUROPE'S DEPENDENCE ON RUSSIAN NATURAL GAS: PERSPECTIVES AND RECOMMENDATIONS FOR A LONG-TERM STRATEGY* 10 (2008), https://www.marshallcenter.org/sites/default/files/files/2019-07/PDF_PUB_OPS_19.pdf [<https://perma.cc/G4BD-Q55Y>]. The United States has undergone a similar move from coal to natural gas but has a large domestic supply of gas, unlike Europe, which was importing ever-larger quantities from Russia. See Glenn McGrath, *Electric Power Sector CO₂ Emissions Drop As Generation Mix Shifts from Coal to Natural Gas*, U.S. ENERGY INFO. ADMIN.: TODAY IN ENERGY (June 9, 2021), <https://www.eia.gov/todayinenergy/detail.php?id=48296> [<https://perma.cc/G7JA-PP7B>] (documenting shift from coal to natural gas); *LNG Exports Drive Expansion of North American Natural Gas Market, Adding 29 bcf of Production by 2033*, WOOD MACKENZIE (Nov. 16, 2022), <https://www.woodmac.com/press-releases/lng-exports-drive-expansion-of-north-american-natural-gas-market-adding-29-bcf-of-production-by-2033/> [<https://perma.cc/H4PH-2UA8>] (documenting growth in U.S. supply); ANDERSON, *supra*, at 5 (citing Europe's "ever-increasing dependence on Russian natural gas").

4. Noah Browning & Nora Buli, *EU Signals Shift to Coal, Accuses Russia of 'Rogue Moves' on Gas*, REUTERS (June 22, 2022, 1:32 PM), <https://www.reuters.com/business/energy/russian-gas-flows-europe-via-nord-stream-ukraine-unchanged-2022-06-22/> [<https://perma.cc/2TTX-Q4FR>].

scheduled-to-close nuclear plants operating longer than planned.⁵ It was not difficult to foresee that this could happen.⁶

The impact of Europe's reliance on Russia for natural gas supplies raises the question: Is the United States setting itself up for similar problems, risking economic and environmental damage, by relying on a single autocratic regime (China) for key supplies for electric vehicles (EVs) and other components needed to decarbonize energy and by relying on a deeply corrupt autocracy (the Democratic Republic of Congo (DRC)) for some of the raw materials for those components? We review the forced move to EVs and other parts of the U.S.'s carbon emission reduction strategy, then consider the reliance on just a few countries, particularly China and the DRC, for the minerals critical to carry out this strategy. We raise concerns that the U.S. could become trapped in an economically and environmentally costly problem, like the one faced by Europe today regarding natural gas supplies, if trade relations with these nations deteriorate.⁷ In addition, we identify ethical issues in acquiring minerals necessary to achieve decarbonization objectives under present policy. As Europe discovered, reliance on an autocratic supplier for important components of energy supply is a recipe for energy insecurity.⁸

5. See *id.*; Vanessa Dezem & Birgit Jennen, *Germany May Resort to Nuclear Plants to Plug Russian Gas Gap*, MINING.COM (Aug. 21, 2022, 9:22 AM), <https://www.mining.com/web/germany-may-resort-to-nuclear-plants-to-plug-russian-gas-gap/> [<https://perma.cc/N9A7-4M8Z>].

6. ANDERSON, *supra* note 3, at 5. Other collateral issues that have arisen from the Russian invasion of Ukraine, such as the drop in fertilizer production and attendant price hikes, pose huge risks, especially for less developed areas. Eddy Wax & Bartosz Brzeziński, *'Enormous' Fertilizer Shortage Spells Disaster for Global Food Crisis*, POLITICO (Aug. 9, 2022, 6:46 PM), <https://www.politico.eu/article/fertilizer-soil-ukraine-war-the-next-global-food-crisis/> [<https://perma.cc/68P4-LW9J>].

7. We are obviously not the first to address this matter but believe it does not receive adequate attention. For an overview, see Jon Yeomans & Fred Harter, *Who Owns the Earth? The Scramble for Minerals Turns Critical*, SUNDAY TIMES (May 1, 2022, 12:01 AM), <https://www.thetimes.co.uk/article/who-owns-the-earth-the-scramble-for-minerals-turns-critical-jbglsgm02> [<https://perma.cc/D9TH-5W86>].

8. See ANDERSON, *supra* note 3, at 5.

I. U.S. DECARBONIZATION POLICY

Greenhouse gases (GHGs) were not a concern when the U.S. enacted the Clean Air Act of 1970.⁹ Since the risk of GHGs were not yet known, the Act focused on six criteria air pollutants: ozone, particulate matter, carbon monoxide, lead, sulfur dioxide (SO₂), and nitrogen dioxide.¹⁰ Levels of these criteria air pollutants have fallen since 1980.¹¹ Carbon monoxide, SO₂, and lead levels are trivial fractions of what existed forty years ago; nitrogen dioxide levels have fallen by two-thirds, ground-level ozone levels by 29%, and particulate matter levels by about one-third since 1990.¹²

When concern began to rise about GHG emissions and their link to climate change,¹³ using existing air pollution legislation to address the problem proved challenging.¹⁴ While GHGs have been in decline in the U.S. since 2005, the country needs to make more progress to meet the Biden Administration's ambitious goals to reduce GHGs.¹⁵ In the

9. See *Clean Air Act Permitting for Greenhouse Gases*, U.S. ENV'T PROT. AGENCY, <https://www.epa.gov/nsr/clean-air-act-permitting-greenhouse-gases> [<https://perma.cc/62NT-C9PM>] (Dec. 30, 2022); The Clean Air Act of 1970, 42 U.S.C. §§ 7401–7642.

10. *Criteria Air Pollutants*, U.S. ENV'T PROT. AGENCY, <https://www.epa.gov/criteria-air-pollutants> [<https://perma.cc/LU4P-KGJZ>] (Aug. 9, 2022).

11. *Air Quality - National Summary*, U.S. ENV'T PROT. AGENCY, <https://www.epa.gov/air-trends/air-quality-national-summary> [<https://perma.cc/7Z7E-JKWE>] (June 1, 2022).

12. *Id.*

13. See INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE: THE IPCC SCIENTIFIC ASSESSMENT 5 (J.T. Houghton, G.J. Jenkins & J.J. Ephraums eds., 1990), https://www.ipcc.ch/site/assets/uploads/2018/03/ipcc_far_wg_I_full_report.pdf [<https://perma.cc/U9QJ-5UKW>]. The Intergovernmental Panel on Climate Change (IPCC) produced its First Assessment Report in 1990. *Id.* That was followed by more IPCC reports and the battle about the extent of the problem and what can and should be done about it has continued since. Some see major global warming and catastrophes; others are dubious about the extent of the problem (and causation). We will not enter into that fray but recognize that U.S. policy calls for GHG reductions to occur.

14. See, e.g., *Massachusetts v. Env't Prot. Agency*, 549 U.S. 497, 528, 534 (2007) (affirming EPA's authority to regulate GHG emissions from new mobile sources and finding that the EPA offered no reasoned explanation for its refusal to decide whether GHGs cause or contribute to climate change); *West Virginia v. Env't Prot. Agency*, 142 S. Ct. 2587, 2616 (2022) (denying EPA authority to adopt a regulatory scheme mandating a nationwide transition away from the use of coal to generate electricity).

15. *Inventory of U.S. Greenhouse Gas Emissions and Sinks*, U.S. ENV'T PROT. AGENCY [hereinafter *Inventory of U.S. GHG*], <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions->

U.S., 79% of GHG emissions are carbon dioxide (CO₂); while three-quarters of the sources of GHGs are split rather evenly across transportation, electric power, and industry, the remainder come from agriculture and commercial and residential buildings.¹⁶

U.S. policy favors reductions in GHGs. But these policies only consisted of a series of ad hoc approaches with little formal regulatory action before 2010.¹⁷ Although the largest decline in GHGs in the U.S. had occurred in electric power generation, it was not expressly a response to federal mandates; CO₂ emissions from electric power generation declined about 40% from 2007 to 2021 due to the shift from coal to natural gas and renewables.¹⁸ Public pressure to reduce emissions, combined with the huge increase in natural gas production from fracking, resulted in the decline in CO₂.¹⁹ Further declines must come largely from other sources. Even if electrical output produced no GHGs, other human GHG sources have not been addressed as

and-sinks [https://perma.cc/V9GW-864J] (Apr. 19, 2023). “Greenhouse gas emissions in 2021 (after accounting for sequestration from the land sector) were 17% below 2005 levels.” *Id.* The bad news may be that the U.S. is not doing enough. Climate Action Tracker, a coalition concerned about GHG reductions, asserts the decline is “[i]nsufficient.” USA, CLIMATE ACTION TRACKER (Aug. 16, 2022), https://climateactiontracker.org/countries/usa/ [https://perma.cc/L47R-W6HC]. Others contend that many countries are wasting resources and are not addressing the problem efficiently. Joseph E. Stiglitz, *Are We Overreacting on Climate Change?*, N.Y. TIMES, https://www.nytimes.com/2020/07/16/books/review/bjorn-lomborg-false-alarm-joseph-stiglitz.html [https://perma.cc/WH8Q-TPFN] (July 27, 2020).

16. *Inventory of U.S. GHG*, *supra* note 15.

17. The U.S. “did not support binding GHG targets and timetables” to reduce GHGs. RICHARD K. LATTANZIO, JANE A. LEGGETT, KEZEE PROCITA, JONATHAN L. RAMSEUR, CORRIE E. CLARK, GENEVIEVE K. CROFT & RENA S. MILLER, CONG. RSCH. SERV., R46947, U.S. CLIMATE CHANGE POLICY 4 (2021) (internal quotation marks omitted). The Obama Administration did not submit the Paris Agreement of 2015 (a follow up to the Kyoto Protocol) to Congress for approval but averred that the U.S. would abide by it. *Id.* at 5. That was repudiated by the Trump Administration but later accepted by the Biden Administration. *Id.*

18. *See Sources of Greenhouse Gas Emissions*, U.S. ENV’T PROT. AGENCY, https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions [https://perma.cc/6DGC-DALX] (Apr. 28, 2023). The large increase in output meant falling prices. *See Henry Hub Natural Gas Spot Price*, U.S. ENERGY INFO. ADMIN.: NAT. GAS (May 3, 2023), https://www.eia.gov/dnav/ng/hist/rngwhhdm.htm [https://perma.cc/XV49-YR96]. The EPA notes that increased efficiency of equipment has assisted in the emission decline. *Sources of Greenhouse Gas Emissions*, *supra*.

19. *See* McGrath, *supra* note 3 (noting that using natural gas instead of coal to generate electricity results in less than half the CO₂ emissions). For an industry view of fracking, see *Hydraulic Fracturing*, INDEP. PETROLEUM ASS’N AM., https://www.ipaa.org/fracking/ [https://perma.cc/5GTF-FTQM]. It notes the large increase in oil and gas output dating to 2007. *Id.*

successfully.²⁰ The ad hoc nature of the American response is one reason its GHG regulation policy puts such heavy weight on the policy levers available without new legislation. As a result, there is great emphasis on electrification of transportation and increasing the proportion of electricity generated by renewables. Both require rapid expansion of battery storage, a part of the energy system where many of the problems we describe are concentrated.²¹ Other industrialized nations have adopted similar policy responses to the U.S. and face the same issue of battery storage expansion.²²

European nations have instituted multiple targets to reduce GHGs as part of their national policies. The United Kingdom will ban new natural gas heating units for homes starting in 2035 and will subsidize the installation of heat pumps instead.²³ The UK also seeks to end the sale of new internal combustion passenger cars by 2030.²⁴ Canada plans the same by 2035²⁵ and France by 2040.²⁶ While there is not yet

20. Human production sources are more susceptible to remedy than natural sources. For example, methane has always been emitted from the arctic tundra. See Li Yuan, *Arctic Tundra Emits More Methane During Autumn Freeze than Spring Thaw*, PHYS.ORG (Nov. 9, 2020), <https://phys.org/news/2020-11-arctic-tundra-emits-methane-autumn.html> [<https://perma.cc/F5HW-NHVA>].

21. We explore some of the problems with reliance on the DRC in more detail in Roger E. Meiners & Andrew P. Morriss, *Addressing Green Energy's 'Resource Curse'*, 33 DUKE ENV'T L. & POL'Y F. 35, 42–47 (2022). These problems arise out of reliance on DRC cobalt production used in technology that helps reduce GHGs. See *id.* at 38.

22. See *id.* at 39.

23. Peter Walker, *£5,000 Grants Unveiled to Support Home Heat Pump Installation*, GUARDIAN (Oct. 18, 2021, 5:00 PM), <https://www.theguardian.com/environment/2021/oct/18/5000-grants-unveiled-to-support-home-heat-pump-installation> [<https://perma.cc/YVR3-LD2N>]. Similarly, California is limiting the use of natural gas in appliances and heating systems in homes and buildings. *New California Rules Move State Away from Natural Gas in New Buildings*, REUTERS (Aug. 11, 2021, 7:28 PM) [hereinafter *New California Rules*], <https://www.reuters.com/legal/litigation/new-california-rules-move-state-away-natural-gas-new-buildings-2021-08-11/> [<https://perma.cc/97YH-7X5K>].

24. Roger Harrabin, *Ban on New Petrol and Diesel Cars in UK from 2030 Under PM's Green Plan*, BBC (Nov. 18, 2020), <https://www.bbc.com/news/science-environment-54981425> [<https://perma.cc/52ET-LCQB>].

25. David Booth, *Canada Moves to End Sale of New Gas-Powered Cars by 2035*, FIN. POST, <https://financialpost.com/commodities/energy/canada-moves-to-ban-internal-combustion-engines-by-2035> [<https://perma.cc/5U4B-URV7>] (June 30, 2021).

26. Amy Held, *France Plans to Ban Sale of Diesel and Gas Vehicles by 2040*, NPR (July 6, 2017, 6:25 PM), <https://www.npr.org/sections/thetwo-way/2017/07/06/535799765/france-plans-to-ban-sale-of-diesel-and-gas-vehicles-by-2040> [<https://perma.cc/T549-N44H>]. Despite national mandates in European countries, Climate Action Tracker currently reports emission reductions to be “[i]nsufficient” based on Europe’s economic ability to bear the costs of reduction. See EU, CLIMATE ACTION TRACKER, <https://climateactiontracker.org/countries/eu/> [<https://perma.cc/4X5A-VBD9>] (Nov. 5, 2022).

an equivalent national mandate in the U.S., some states have declared that all new cars must be electric after a specified date.²⁷ Similarly, there are state-level mandates regarding appliances and heating.²⁸

The Biden Administration is targeting a 50%–52% reduction of GHGs from 2005 levels by 2030.²⁹ But some of the Administration’s strategy rests on relatively vague components, such as “wider use of heat pumps” with few specifics on implementation.³⁰ These vague components will ultimately have to come through regulatory action or federal legislation, particularly in light of the Supreme Court’s decision in *West Virginia v. Environmental Protection Agency*, restricting the Agency’s ability to take “major” regulatory actions without explicit congressional authorization.³¹ Even the Inflation Reduction Act of 2022 (IRA),³² which calls for 950 million solar

27. See *Fact Sheet: President Biden Announces Steps to Drive American Leadership Forward on Clean Cars and Trucks*, WHITE HOUSE (Aug. 5, 2021) [hereinafter *Biden’s Steps Toward Clean Cars*], <https://www.whitehouse.gov/briefing-room/statements-releases/2021/08/05/fact-sheet-president-biden-announces-steps-to-drive-american-leadership-forward-on-clean-cars-and-trucks/> [https://perma.cc/PHR5-WW7X]; see, e.g., *Governor Newsom Announces California Will Phase Out Gasoline-Powered Cars & Drastically Reduce Demand for Fossil Fuel in California’s Fight Against Climate Change*, OFF. GOVERNOR GAVIN NEWSOM (Sept. 23, 2020) [hereinafter *California Phases Out Gas-Powered Cars*], <https://www.gov.ca.gov/2020/09/23/governor-newsom-announces-california-will-phase-out-gasoline-powered-cars-drastically-reduce-demand-for-fossil-fuel-in-californias-fight-against-climate-change/> [https://perma.cc/52JW-8YZB] (explaining that California is requiring all new vehicle sales to be electric by 2035).

28. E.g., *New California Rules*, *supra* note 23.

29. *Fact Sheet: President Biden Sets 2030 Greenhouse Gas Pollution Reduction Target Aimed at Creating Good-Paying Union Jobs and Securing U.S. Leadership on Clean Energy Technologies*, WHITE HOUSE (Apr. 22, 2021) [hereinafter *Biden Sets Pollution Target*], <https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/22/fact-sheet-president-biden-sets-2030-greenhouse-gas-pollution-reduction-target-aimed-at-creating-good-paying-union-jobs-and-securing-u-s-leadership-on-clean-energy-technologies/> [https://perma.cc/F858-TU27]. As noted, a portion of the goal has been achieved because emissions decreased from 2005, but the targeted decline is ambitious to achieve in less than a decade. See *supra* note 15 and accompanying text. The policy statement expressly lists EV batteries as part of the policy. See *Biden Sets Pollution Target*, *supra*.

30. *Biden Sets Pollution Target*, *supra* note 29.

31. See *West Virginia v. Env’t Prot. Agency*, 142 S. Ct. 2587, 2605 (2022).

32. For an overview of the Act, see *By the Numbers: The Inflation Reduction Act*, WHITE HOUSE (Aug. 15, 2022), <https://www.whitehouse.gov/briefing-room/statements-releases/2022/08/15/by-the-numbers-the-inflation-reduction-act/> [https://perma.cc/XPA2-T835]. For further detail, see Exec. Order No. 14,082, 87 Fed. Reg. 56861 (Sept. 16, 2022).

panels,³³ 120,000 wind turbines,³⁴ and 2,300 grid-scale battery plants,³⁵ relies primarily on mandating nearly \$400 billion in federal spending over a decade for specific “clean energy” technology rather than mandatory regulations.³⁶

Like the decades-out European commitments to carbon reduction, the targets set by the IRA rely on ambitious targets, requiring massive increases in production and installation of new technologies in less than a decade.³⁷ Academics and environmental groups have promoted potentially more effective CO₂ emission reduction strategies, such as a tax on carbon emissions. Economists generally favor such a tax as it stimulates incentives to develop new technologies to reduce emissions without specific mandates about the kind of technology to be used.³⁸ Yet, such taxes have not found favor in Congress, and there seems to

33. *By the Numbers: The Inflation Reduction Act*, *supra* note 32. There will have to be a massive increase in production of panels to meet that goal as less than 29 million, a record, were shipped in 2021. U.S. ENERGY INFO. ADMIN., 2021 ANNUAL SOLAR PHOTOVOLTAIC MODULE SHIPMENTS REPORT 3 tbl.3 (2022), https://www.eia.gov/renewable/annual/solar_photo/pdf/pv_full_2021.pdf [https://perma.cc/FPP6-83VY]. Most panels come from Asia. Lolita Jamison & Elesia Fasching, *Record Numbers of Solar Panels Were Shipped in the United States During 2021*, U.S. ENERGY INFO. ADMIN.: TODAY IN ENERGY (Sept. 1, 2022), <https://www.eia.gov/todayinenergy/detail.php?id=53679> [https://perma.cc/RB6K-J88P].

34. *By the Numbers: The Inflation Reduction Act*, *supra* note 32. That would almost double the existing 70,800 turbines. *How Many Turbines Are Contained in the U.S. Wind Turbine Database?*, U.S. GEOLOGICAL SURV., <https://www.usgs.gov/faqs/how-many-turbines-are-contained-us-wind-turbine-database> [https://perma.cc/LB5T-FS99].

35. *By the Numbers: The Inflation Reduction Act*, *supra* note 32. The technology for grid-scale batteries appears to be the most nascent of this group as the current storage capabilities of these batteries is small. See Max Schoenfisch & Amrita Dasgupta, *Grid-Scale Storage*, INT’L ENERGY AGENCY, <https://www.iea.org/reports/grid-scale-storage> [https://perma.cc/4U6D-2CPT].

36. See Justin Badlam, Jared Cox, Adi Kumar, Nehal Mehta, Sara O’Rourke & Julia Silvis, *The Inflation Reduction Act: Here’s What’s in It*, MCKINSEY & CO. (Oct. 24, 2022), <https://www.mckinsey.com/industries/public-and-social-sector/our-insights/the-inflation-reduction-act-heres-whats-in-it> [https://perma.cc/6AHY-9FSK].

37. With emissions in some European countries rising, meeting targeted goals appears ever less likely. Angela Cullen, *Germany’s Carbon Emissions Rise in Setback for Climate Goals*, BLOOMBERG (Mar. 15, 2022, 8:38 AM), <https://www.bloomberg.com/news/articles/2022-03-15/germany-s-carbon-emissions-rise-in-setback-for-climate-goals> [https://perma.cc/GFW3-4DCQ].

38. See, e.g., *Economists’ Statement on Carbon Dividends Organized by the Climate Leadership Council*, ECONSTATEMENT.ORG, <https://www.econstatement.org/> [https://perma.cc/4GKM-VEX8]. A handful of countries adopted such taxes. For a short overview, see Chris Fleisher, *An Efficient Way to Reduce Emissions: Carbon Taxes May Be More Effective in Curbing Pollution than Previously Believed.*, AM. ECON. ASS’N. (Nov. 15, 2019), <https://www.aeaweb.org/research/carbon-tax-impact-sweden> [https://perma.cc/5SBQ-DLSH].

be little prospect that any such tax will be adopted in time to affect current decarbonization goals.³⁹

These details aside, GHG emissions have been declining in the U.S., Europe, and Japan.⁴⁰ Despite individual country emission declines, global GHG emissions continue to rise. They rose about 10% in the last decade.⁴¹ In China, CO₂ emissions rose almost 40% from 2009 to 2019.⁴² In India, which has a much smaller economy than China, CO₂ emissions rose 56% in the same time frame.⁴³ In both countries, which together have more than one-third of the world's population, as well as in many other developing countries, coal use has been rapidly rising as the primary source of electricity.⁴⁴ Given the rise in coal-based electricity production, which these nations see as necessary for economic output (income) and personal comfort to increase, global GHG emissions are likely to continue to rise regardless of further

39. Politicians dislike carbon-emissions taxes because they do not allow as much distribution of special interest favors as do mandated technologies that guarantee sales of various products. Elon Musk (and many others) was enriched by federal subsidies for green energy goals before. See Jerry Hirsch, *Elon Musk's Growing Empire Is Fueled by \$4.9 Billion in Government Subsidies*, L.A. TIMES (May 30, 2015, 8:00 AM), <https://www.latimes.com/business/la-fi-hy-musk-subsidies-20150531-story.html> [<https://perma.cc/27TX-DXF4>]. This is not to be critical of Mr. Musk. Some companies will get the subsidy—and the investors know which politicians delivered the goods.

40. For Japan, emissions are now about where they were forty years ago. See Hannah Ritchie & Max Roser, *Japan: CO₂ Country Profile*, OUR WORLD DATA, <https://ourworldindata.org/co2/country/japan> [<https://perma.cc/C8RB-LHP7>]. For the U.S., GHG emissions have decreased 7% from 1990 to 2020. *Climate Change Indicators: Greenhouse Gases*, U.S. ENV'T PROT. AGENCY, <https://www.epa.gov/climate-indicators/greenhouse-gases#:~:text=Since%202005%2C%20however%2C%20total%20U.S.,States%2C%20followed%20by%20electricity%20generation> [<https://perma.cc/M3BL-W3ZQ>] (Aug. 1, 2022). For Europe, GHG emission has decreased 32% between 1990 and 2020. *Total Greenhouse Gas Emission Trends and Projections in Europe (8th EAP)*, EUR. ENV'T AGENCY (Oct. 26, 2022, 9:40 AM), <https://www.eea.europa.eu/ims/total-greenhouse-gas-emission-trends> [<https://perma.cc/9X28-9T75>].

41. See Hannah Ritchie & Max Roser, *Greenhouse Gas Emissions*, OUR WORLD DATA, <https://ourworldindata.org/greenhouse-gas-emissions> [<https://perma.cc/XA5T-WKUC>].

42. See *China*, INT'L ENERGY AGENCY, <https://www.iea.org/countries/china> [<https://perma.cc/2PB9-D9BG>].

43. See *India*, INT'L ENERGY AGENCY, <https://www.iea.org/countries/india> [<https://perma.cc/59TH-WKHD>].

44. See *Coal*, INT'L ENERGY AGENCY, <https://www.iea.org/fuels-and-technologies/coal> [<https://perma.cc/L4D5-95A9>]. India, China, and many other countries are building more coal-fired power plants. See *Coal-Fired Power Capacity by Country (MW)*, GLOB. ENERGY MONITOR, https://docs.google.com/spreadsheets/d/1_6AkrRZOn3ZXhSV9O6tZnX-m7aJsfG9HiQ_iEqBkbW8/edit#gid=1228809590 [<https://perma.cc/CCD7-R76P>] (providing data as of January 2023).

emission reductions in the U.S. and the European Union.⁴⁵ We will return to this issue later but now turn to the main points of this Article—the ethical and strategic issues arising from energy decarbonization policy in the U.S.

II. ETHICAL ISSUES IN EXISTING DECARBONIZATION POLICY

Economists and engineers think about the efficiency issues involved in energy. Engineers, of course, help invent, design, and produce new technologies—some working better than others, while some are defeated by costs rather than a lack of technical excellence. As previously noted, economists often favor carbon taxes as a potentially efficient way to force GHG emissions to fall. Economists do so from a belief that providing incentives and allowing the economic chips to fall where they may is the best way to incentivize the development of new technologies.⁴⁶ The key insight behind the economic preference for more general incentives is that we cannot know today how the race to create better products will evolve and what will be the least costly means of achieving the objective of producing less carbon-intense energy.⁴⁷ In such a competition, government does not pick the winners by dictating specific technologies (e.g., grid-scale batteries, EVs, wind turbines). From the economic point of view, a policy encouraging competition to spur evolution of better technology is a more efficient way to achieve carbon reductions compared to a policy built around enshrining specific technologies in legislation that reaches far into the future. For example, regardless of the merits of the process Congress used to choose which technologies would be subsidized by the IRA,

45. See Press Release, International Energy Agency, Global CO₂ Emissions Rebounded to Their Highest Level in History in 2021 (Mar. 8, 2022), <https://www.iea.org/news/global-co2-emissions-rebounded-to-their-highest-level-in-history-in-2021> [https://perma.cc/5FEM-ZC5A].

46. Jonathan Marshall, *Carbon Taxes: Accelerating Innovation While Cutting Emissions*, CITIZENS' CLIMATE LOBBY (Mar. 1, 2020), <https://citizensclimatelobby.org/blog/policy/carbon-taxes-accelerating-innovation-while-cutting-emissions/> [https://perma.cc/4LQH-KXR3].

47. Ian Parry, *Putting a Price on Pollution: Carbon-Pricing Strategies Could Hold the Key to Meeting the World's Climate Stabilization Goals*, FIN. & DEV., Dec. 2019, at 16, 17–18. Not dictating technology via legislation may be considered more ethical as it helps reduce special interest pandering, but economists generally focus on the economic benefits of “revenue-neutral” policies such as carbon taxes. See *id.* at 18.

the Act embeds technological choices in the law.⁴⁸ As discussed below, these embedded technology decisions implicate many ethical and economic issues, producing costly consequences that could increase significantly moving forward.⁴⁹

Partly because of the narrowly focused incentives provided by the federal and some state governments, EV sales are rising rapidly.⁵⁰ Increasing EV's share of the motor vehicle fleet is a key component in the decarbonization of the transportation sector.⁵¹ Currently, EV (and grid-scale) batteries require a number of minerals, including cobalt and lithium, which are primarily produced outside of the U.S.⁵² Both minerals play a major role in constructing EV batteries and in addressing increased reliance on intermittent power sources, such as solar and wind.⁵³ In line with federal and state goals, the U.S. Energy

48. See Badlam et al., *supra* note 36. A major policy change is unlikely to occur. In passing the Act, Congress made decisions with substantive information about alternatives, such as carbon taxes, but devised a set of policies that reward special interests of those that pressed for the policies and strengthened such interests by structuring the market in ways beneficial to such interests. This is not to condemn special interests—everyone has them and becomes stronger proponents of policies when they make investments based on policy decisions.

49. As economists, we are shy to raise ethical issues. Economists going back at least to Adam Smith have been aware of them but generally stick to nuts and bolts issues of direct economic costs and benefits. For a general overview, see Stephen R. C. Hicks, *Ethics and Economics*, ECONLIB, <https://www.econlib.org/library/Enc/EthicsandEconomics.html> [<https://perma.cc/2UB8-5BG6>].

50. Battery-powered and hybrid vehicle sales now account for about a quarter of new car sales in China and one-fifth in Europe; sales lag behind in the U.S. but are rising rapidly due to mandates in many states. See Peter Mock & Zifei Yang, *A 2022 Update on Electric Car Sales: China Taking the Lead, the U.S. Catching Up, and Europe Falling Behind*, INT'L COUNCIL ON CLEAN TRANSP. (Aug. 19, 2022), <https://theicct.org/2022-update-ev-sales-us-eu-ch-aug22/> [<https://perma.cc/CD96-ZA77>]. The mandates could result in the market share of EVs in the U.S. surpassing Europe soon. See *id.* The energy savings from EVs may be less than advertised as EVs are driven about half as much as gasoline-powered cars. See Fiona Burlig, James B. Bushnell, David S. Rapson & Catherine Wolfram, *Low Energy: Estimating Electric Vehicle Electricity Use 1–2* (Nat'l Bureau of Econ. Rsch., Working Paper No. 28451, 2021), https://www.nber.org/system/files/working_papers/w28451/w28451.pdf [<https://perma.cc/8CWV-ZP2V>]. That is, they do not appear to be complete substitutes for gas-powered cars. *Id.*

51. Cf. *California Phases Out Gas-Powered Cars*, *supra* note 27 (noting that California will ban gasoline-powered vehicles in 2035); David Booth, *supra* note 25 (reporting that Canada will follow suit); Harrabin, *supra* note 24 (noting UK's ban begins in 2035).

52. Jordan Brinn, *Electric Vehicle Battery Supply Chains: The Basics*, NAT. RES. DEF. COUNCIL (July 7, 2022), <https://www.nrdc.org/experts/jordan-brinn/electric-vehicle-battery-supply-chains-101> [<https://perma.cc/K3P4-DRKR>].

53. See BRANDON S. TRACY, CONG. RSCH. SERV., R47227, *CRITICAL MINERALS IN ELECTRIC VEHICLE*

Information Administration (EIA) projects a significant rise in electricity in the U.S. produced by solar and wind (and a continued decline in coal) to meet the increased demand for electricity from EVs and heat pumps.⁵⁴

The production of EV batteries must therefore rise significantly.⁵⁵ Shifting cars and trucks to electricity, homes from natural gas and other non-renewables to electricity, and electricity generation from fossil fuels to more solar and wind requires energy storage to smooth intermittent availability. This requires physical capital (in particular, batteries). Unfortunately, these shifts also depend on using inputs mined in environmentally damaging ways in locations lacking basic governance institutions and by methods frequently involving human rights violations.⁵⁶ These problems will be magnified moving forward as demand for products such as batteries rises.⁵⁷ These consumption

BATTERIES 4 (2022). The issue is not limited to cobalt and lithium. Many important minerals are produced primarily or entirely outside the U.S.: 100% of arsenic, asbestos, cesium, fluorspar, gallium, graphite, indium, manganese, mica, neypeline syenite, niobium, (some) rare earths, rubidium, scandium, strontium, tantalum, and yttrium. U.S. GEOLOGICAL SURV., MINERAL COMMODITY SUMMARIES 2021, at 7 fig.2 (2021), <https://pubs.usgs.gov/periodicals/mcs2021/mcs2021.pdf> [<https://perma.cc/G44X-BHED>].

54. *Annual Energy Outlook 2022*, U.S. ENERGY INFO. ADMIN. (Mar. 3, 2022), <https://www.eia.gov/outlooks/aeo/narrative/electricity/sub-topic-02.php> [<https://perma.cc/QW8V-3F5K>]. EIA projects wind and solar generated electricity will rise from 13% of domestic output to 36% by 2050, primarily to offset the decline in coal usage. *See id.*

55. Industry consultant AlixPartners estimates that battery production for EVs will more than quadruple from 2021 to 2025. Phil LeBeau, *Tesla Co-Founder Says EV Sales Are About to Take Off, but Questions Whether Production Can Keep Up*, CNBC, <https://www.cnbc.com/2022/01/12/tesla-co-founder-says-ev-sales-are-about-to-take-off-but-questions-whether-production-can-keep-up.html> [<https://perma.cc/QAQ5-RZZZ>] (Jan. 12, 2022, 8:22 PM). For load issues caused by intermittent solar power generation, see *Annual Energy Outlook 2022*, *supra* note 54.

56. *See* Dionne Searcey, Michael Forsythe & Eric Lipton, *A Power Struggle over Cobalt Rattles the Clean Energy Revolution*, N.Y. TIMES, <https://www.nytimes.com/2021/11/20/world/china-congo-cobalt.html> [<https://perma.cc/VDL8-TR65>] (Dec. 7, 2021).

57. The rise stems, in part, from goals to increase EV sales. *See, e.g., Biden's Steps Toward Clean Cars*, *supra* note 27; Nancy W. Stauffer, *China's Transition to Electric Vehicles*, MIT ENERGY INITIATIVE (Nov. 25, 2020), <https://energy.mit.edu/news/chinas-transition-to-electric-vehicles/> [<https://perma.cc/9GLS-CVUX>]; Kate Abnett, *EU to Target 30 Million Electric Cars by 2030 - Draft*, REUTERS (Dec. 4, 2020, 12:05 PM), <https://www.reuters.com/article/us-climate-change-eu-transport/eu-to-target-30-million-electric-cars-by-2030-draft-idUSKBN28E2KM> [<https://perma.cc/R5LQ-7ZM3>]; Roland Irle, *Global EV Sales for 2022*, EVVOLUMES.COM, www.ev-volumes.com/ [<https://perma.cc/59CL-3Z2X>]. Additionally, greater charging convenience, increased selection of EV

pressures mean that global demand for battery capacity may grow as much as tenfold in the next decade.⁵⁸ Further, China currently dominates EV battery production.⁵⁹ As of 2021, China produced 79% of EV batteries, followed by the U.S., which produced just 6.2%.⁶⁰ While capacity in Germany and other countries is expected to grow, China is projected to continue its lead with 65% of manufacturing capacity in 2025.⁶¹

Moreover, whether finished batteries are produced in Germany or the U.S., key inputs such as cobalt primarily come from suppliers in other countries.⁶² World demand for cobalt is rising rapidly—by 20% in 2021 alone.⁶³ More than 70% of that cobalt came from the DRC,⁶⁴ and more than 80% of the finished cobalt product comes from China.⁶⁵ China is also the primary user of cobalt in battery production.⁶⁶ Expanding renewable energy use in homes through local storage also increases battery use, thus increasing the demand for cobalt and other

models, and financial benefits (most vehicles qualify for a \$7,500 federal tax credit) are likely to spur sales. See *Federal Tax Credits for New All-Electric and Plug-In Hybrid Vehicles*, U.S. DEP'T ENERGY: FUELECONOMY.GOV, <https://www.fueleconomy.gov/feg/tax2022.shtml> [<https://perma.cc/6ACK-C9QA>]. Batteries account for about one-fourth of the cost of EV production. Mike Colias, *Ford Plans to Manufacture Its Own Batteries for Electric Vehicles*, WALL ST. J. (Apr. 27, 2021, 12:47 PM), <https://www.wsj.com/articles/ford-plans-to-manufacture-its-own-batteries-for-electric-vehicles-11619542051> [<https://perma.cc/7FMU-XUEH>].

58. See S. O'Dea, *Projected Global Battery Demand from 2020 to 2030, by Application*, STATISTA (Jan. 5, 2023), <https://www.statista.com/statistics/1103218/global-battery-demand-forecast/> [<https://perma.cc/XPR5-3Y9W>]. Such forecasts are difficult but are made assuming that policy goals will be met, so they are not bogus.

59. See Govind Bhutada, *Mapped: EV Battery Manufacturing Capacity, by Region*, VISUAL CAPITALIST, <https://www.visualcapitalist.com/sp/mapped-ev-battery-manufacturing-capacity-by-region/> [<https://perma.cc/8MWF-V7UW>] (Feb. 28, 2022).

60. *Id.*

61. *Id.*

62. See *Global Cobalt Production Hits Record High in 2021, Boosted by EV Demand*, MINING.COM (Feb. 7, 2022, 10:00 AM) [hereinafter *Global Cobalt Production*], <https://www.mining.com/global-cobalt-production-hits-record-high-in-2021-boosted-by-ev-demand/> [<https://perma.cc/FL4U-C42J>].

63. *Id.*

64. *Id.* Russia comes in a distant second. *Id.* The DRC has long been the source for cobalt. When it was a Belgian colony in 1938, the vast majority of cobalt came from there. See Adebayo Adedeji, *The Economic Evolution of Developing Africa*, in 8 THE CAMBRIDGE HISTORY OF AFRICA 192, 198 (John E. Crowder ed., 1984).

65. *Global Cobalt Production*, *supra* note 62. That is, state-owned companies in China buy and refine most of the cobalt produced in the DRC. See Sean Carberry, *Critical Mineral: United States Seeking Alternatives to Chinese Cobalt*, NAT'L DEF., Aug. 2022, at 28, 28.

66. *Global Cobalt Production*, *supra* note 62.

minerals.⁶⁷ The problem with cobalt is not limited to the DRC. Other cobalt producers lack good governance, including Russia, the Philippines, and Cuba.⁶⁸ The high demand for cobalt, along with concerns about its sources, has encouraged industry to look for other sources and minerals that could work well in rechargeable batteries;⁶⁹ however, viable substitutes have yet to be found.

Particularly, relying on the DRC raises the ethical issue of dealing with a deeply corrupt government. Transparency International ranks the DRC as similar to Afghanistan and North Korea as among the most corrupt countries in the world.⁷⁰ As an example, the UK's Serious Fraud Office has accused a friend of the former president of the DRC of orchestrating \$360 million in bribes to officials between 2006 and 2011, which resulted in under-market prices for sales of minerals, costing the country more than a billion dollars in lost revenue.⁷¹

67. Batteries for commercial buildings and residences must become more common so intermittent power from wind and solar sources can be stored. Tesla sells the Powerwall battery for home installation to store energy from sources like home solar panels. Aria Alamalhodaei, *Tesla Has Installed 200,000 Powerwalls Around the World So Far*, TECHCRUNCH (May 26, 2021, 5:01 PM), <https://techcrunch.com/2021/05/26/tesla-has-installed-200000-powerwalls-around-the-world-so-far/> [https://perma.cc/JWE5-C9PN]. Other vendors are entering the market. See, e.g., Chris Davies, *Kohler Power Reserve Takes on Tesla Powerwall with Modular Home Battery*, SLASHGEAR (Jan. 3, 2022, 7:00 AM), <https://www.slashgear.com/kohler-power-reserve-takes-on-tesla-powerwall-with-modular-home-battery-03704945/> [https://perma.cc/PC66-NP6J].

68. See *Profiling the World's Eight Largest Cobalt-Producing Countries*, NS ENERGY (Feb. 22, 2021), <https://www.nsenerybusiness.com/features/top-cobalt-producing-countries/> [https://perma.cc/5K8C-JQG7]; *Corruption Perceptions Index*, TRANSPARENCY INT'L, <https://www.transparency.org/en/cpi/2022> [https://perma.cc/WU68-428F] (giving all three countries low corruption scores for 2022, signaling corrupt governments: Cuba (45/100), Philippines (33/100), and Russia (28/100)).

69. See Pratima Desai, *Explainer: Costs of Nickel and Cobalt Used in Electric Vehicle Batteries*, REUTERS (Feb. 3, 2022, 10:05 AM), <https://www.reuters.com/business/autos-transportation/costs-nickel-cobalt-used-electric-vehicle-batteries-2022-02-03/> [https://perma.cc/3D5T-8JAU].

70. *Corruption Perceptions Index*, *supra* note 68 (providing DRC with a corruption score of 20/100, Afghanistan with a score of 24/100, and North Korea with a score of 17/100 as of 2022). For example, the DRC's current government has accused former President Joseph Kabila of large-scale theft. See Thomas Fessy, *Congo Investigation a Chance to Fight Corruption*, HUM. RTS. WATCH (Dec. 1, 2021, 5:59 PM), <https://www.hrw.org/news/2021/12/02/congo-investigation-chance-fight-corruption> [https://perma.cc/6S5L-P8NE]. As the Transparency International ranking of the country has changed little since the departure of Kabila, it is unclear that there has been substantive change. *Compare Corruption Perceptions Index*, TRANSPARENCY INT'L, <https://www.transparency.org/en/cpi/2021/index/cod> [https://perma.cc/CEN3-SGF4] (2021 score of 19/100), *with Corruption Perceptions Index*, *supra* note 68 (2022 score of 20/100).

71. Emily Tian, *UK Fraud Watchdog Digs into Alleged Mine Bribes in DR Congo*, ORGANIZED CRIME & CORRUPTION REPORTING PROJECT (July 23, 2021), <https://www.occrp.org/en/daily/14897-uk-fraud-watchdog-digs-into-alleged-mine-bribes-in-dr-congo> [https://perma.cc/NP69-6X8S].

Scolding and lecturing the DRC government or imposing economic sanctions—which will be difficult to implement if cobalt is needed from DRC mines—is unlikely to convince the government to oversee mining practices that are not injuring children and see revenues going to benefit ordinary citizens. Sanctions may matter little⁷² and are unlikely to force beneficial changes on DRC leaders. Abusive practices are longstanding.⁷³ The fight to control valuable resources means that life for people on the ground is hellish.⁷⁴ Yet, restricting the use of cobalt mined in the DRC is literally impossible if governments are to meet their existing green energy targets. Just as Europe found itself in a quandary from its dependence on Russian natural gas, industrialized countries seeking to decarbonize their transportation sectors through conversion of internal combustion

72. More than a year into Russian's invasion of Ukraine, the impact of sanctions imposed on Russia has been less than expected. See Joseph Giglio, *Russian Ruble Rebounds as Russia and China Work Hard at De-Dollarization*, PATRIOT LEDGER (Oct. 1, 2022, 10:00 AM), <https://www.patriotledger.com/story/opinion/columns/2022/10/01/russian-ruble-makes-large-gains-spite-ukrainian-war-sanctions-european-union-president-biden-china/8139679001/> [<https://perma.cc/98JU-AVTU>].

73. The International Labour Organization (ILO) estimates that in 2016, about 20% of the children in Africa were in slavery or forced labor. ALLIANCE 8.7, REGIONAL BRIEF FOR AFRICA: 2017 GLOBAL ESTIMATES OF MODERN SLAVERY AND CHILD LABOUR 2 (2017). Several years ago, there was great concern about human rights abuses arising from “blood minerals” or “conflict minerals” from the DRC. See Alberto Rojas Blanco & Raquel Villacija, *Blood and Minerals: Who Profits from Conflict in DRC?*, AL JAZEERA (Jan. 19, 2016), <https://www.aljazeera.com/features/2016/1/19/blood-and-minerals-who-profits-from-conflict-in-drc> [<https://perma.cc/7SZB-RBDE>]. In response to such problems, Section 1502 of the 2010 Dodd-Frank Wall Street Reform and Consumer Protection Act discouraged electronics makers from sourcing conflict minerals (tin, tantalum, and tungsten) from the DRC. See Dodd-Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 111-203, § 1502, 124 Stat. 1376, 2213 (2010) (codified as amended at 15 U.S.C. § 78m(p)). There is evidence the Act did not have desirable results, as infant mortality in the mineral producing area rose significantly. See Dominic P. Parker, Jeremy D. Foltz & David Elsea, *Unintended Consequences of Sanctions for Human Rights: Conflict Minerals and Infant Mortality*, 59 J.L. & ECON. 731, 734 (2016).

74. See *Rwanda and the DRC at Risk of War as New M23 Rebellion Emerges: An Explainer*, AFR. CTR. STRATEGIC STUD. (June 29, 2022), <https://africacenter.org/spotlight/rwanda-drc-risk-of-war-new-m23-rebellion-emerges-explainer/> [<https://perma.cc/G2QN-L9HF>]. For more details concerning on-the-ground horrors, see Andres Schipani, *How the DRC Became the Battleground of a Proxy War over Precious Resources*, FIN. TIMES (Oct. 27, 2022), <https://on.ft.com/3TWiBS8> [<https://perma.cc/B95C-YNBZ>].

engine fleets to EVs will soon find their dependence on the DRC and China to be problematic.⁷⁵

The ethical problems that arise from the DRC's cobalt are exacerbated because 15%–30% of its production comes from “artisanal” mines.⁷⁶ An artisanal mine is a “small mine worked through hand digging, hauling, and sorting—back-breaking labor.”⁷⁷ Children frequently work in artisanal mines;⁷⁸ the United Nations Children's Fund estimates 40,000 children are involved.⁷⁹ The U.S. Department of State reports that the DRC “does not fully meet the minimum standards for the elimination of trafficking [which includes child labor]

75. Canada's government has taken action to reduce Chinese influence in Canadian mining firms, but this does not address the deeper problem of Chinese domination of the market. See Paul Vieira & Vipal Monga, *Canada Orders Chinese Companies to Divest from Miners After Security Review*, WALL ST. J., <https://www.wsj.com/articles/canada-orders-chinese-companies-to-divest-from-miners-after-security-review-11667427265> [<https://perma.cc/8YRH-EL3F>] (Nov. 2, 2022, 7:43 PM).

76. WORLD ECON. F., MAKING MINING SAFE AND FAIR: ARTISANAL COBALT EXTRACTION IN THE DEMOCRATIC REPUBLIC OF THE CONGO 3 (2020), https://www3.weforum.org/docs/WEF_Making_Mining_Safe_2020.pdf [<https://perma.cc/62MH-HW5Z>]. “[T]here are between 150,000 and 200,000 artisanal miners in Lualaba alone.” *Id.* at 6. Similarly, a substantial amount of gold comes from artisanal mines and is controlled by organized crime. See Julett Pineda Sleinan, *Report: Criminals in Central Africa Profit from New Surge in Gold Prices*, ORGANIZED CRIME & CORRUPTION REPORTING PROJECT (July 2, 2021), <https://www.occrp.org/en/daily/14747-report-criminals-in-central-africa-profit-from-new-surge-in-gold-prices> [<https://perma.cc/8PDY-A944>].

77. Meiners & Morriss, *supra* note 21, at 44–45.

78. The income from children's labor is important in a country where per capita annual income is only about \$600. See *GDP Per Capita (Current US\$) – Congo, Dem. Rep.*, WORLD BANK, <https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=CD> [<https://perma.cc/K3S4-YK8G>]. Besides the immediate humanitarian issues in child labor, there is evidence that child labor results in lower levels of educational achievement compared to similar areas where there is no mining. Pelle Ahlerup, Thushyanthan Baskaran & Arne Bigsten, *Gold Mining and Education: A Long-Run Resource Curse in Africa?*, 56 J. DEV. STUD. 1745, 1747 (2020).

79. *Is My Phone Powered by Child Labour?*, AMNESTY INT'L, <https://www.amnesty.org/en/latest/campaigns/2016/06/drc-cobalt-child-labour/> [<https://perma.cc/9AW2-M3ZC>]. That labor estimate is before the demand for cobalt jumped significantly. The DRC claims to now be taking steps to deal with the matter. See Press Release, United Nations Children's Fund (UNICEF): Democratic Republic of Congo, RCS Global and UNICEF Announce Collaboration to Tackle Child Rights Infringements in Artisanal Mining (Aug. 30, 2021), <https://www.unicef.org/drcongo/en/press-releases/rcsglobal-unicef-collaboration-tackle-child-rights-infringements-mining> [<https://perma.cc/L6J9-4E38>]. Such efforts have been made before and appear not to have had a major effect. See Cornelia Walther, *In DR Congo, UNICEF Supports Efforts to Help Child Labourers Return to School*, RELIEFWEB (June 15, 2012), <https://reliefweb.int/report/democratic-republic-congo/dr-congo-unicef-supports-efforts-help-child-labourers-return-school> [<https://perma.cc/3SU7-6XUR>].

and is not making significant efforts to do so.”⁸⁰ Artisanal cobalt mining employs children as young as six years old who “spend the entire day in the cobalt mines of [DRC] bent over, digging with a small shovel or bare hands to gather cobalt-containing heterogenite stones.”⁸¹ Exposure to cobalt mining dust may lead to “exposure-related oxidative DNA damage.”⁸²

Indeed, because of the country’s dominant share of the world’s cobalt reserves, the DRC’s artisanal mines produce more cobalt than all other countries combined.⁸³ The humanitarian problem is unlikely to be solved by western cobalt-consuming nations banding together and insisting on improved working conditions in the DRC’s mines. Chinese firms dominate cobalt production in the DRC and control even

80. 2019 *Trafficking in Persons Report: Democratic Republic of the Congo*, U.S. DEP’T STATE, <https://www.state.gov/reports/2019-trafficking-in-persons-report-2/democratic-republic-of-the-congo/> [https://perma.cc/PNK3-YUZW]. For a report with many photos, see Nima Elbagir, Dominique van Heerden & Eliza Mackintosh, *Dirty Energy*, CNN, <https://edition.cnn.com/interactive/2018/05/africa/congo-cobalt-dirty-energy-intl/> [https://perma.cc/2X7Q-JBEJ].

81. James Melville, *From Stone to Phone: Modern Day Cobalt Slavery in Congo*, BYLINE TIMES (June 19, 2020), <https://bylinetimes.com/2020/06/19/from-stone-to-phone-modern-day-cobalt-slavery-in-congo/> [https://perma.cc/53LK-EJFT]; see Amy Joi O’Donoghue, *Are Children ‘Dying like Dogs’ in Effort to Build Better Batteries?*, DESERET NEWS (May 24, 2021, 12:00 AM), <https://www.deseret.com/utah/2021/5/23/22441889/our-children-are-dying-like-dogs-congo-slave-labor-cobalt-lawsuit-apple-tesla-human-rights-dell> [https://perma.cc/2U7U-KXY9].

82. Célestin Banza Lubaba Nkulu, Lidia Casas, Vincent Haufroid, Thierry De Putter, Nelly D. Saenen, Tony Kayembe-Kitenge, Paul Musa Obadia, Daniel Kyanika Wa Mukoma et al., *Sustainability of Artisanal Mining of Cobalt in DR Congo*, 1 NATURE SUSTAINABILITY 495, 495, 499–501 (2018). The authors explain that high exposure levels also exist for uranium, copper, manganese, nickel, and vanadium mined in the same areas as cobalt. *Id.* at 496. Companies know this and some want to avoid the bad publicity that may result. Elon Musk has called out Apple for using much more cobalt in its batteries than used in Tesla batteries. Chris Ciaccia, *Elon Musk Blasts Apple Twice During Tesla Earnings Call: Slams Tech Giant’s Use of Cobalt in Batteries and Claims Its Bosses Are More Obsessed with Controlling Software on Its Devices than Helping Boost Sustainability*, DAILY MAIL, <https://www.dailymail.co.uk/sciencetech/article-9830961/Elon-Musk-blasts-Apple-twice-Tesla-earnings-use-cobalt-does-business.html> [https://perma.cc/K8SL-A9H8] (July 27, 2021, 4:00 PM). He noted the human rights issues. *Id.* While such pressure may have an impact on wealthy consumers in few countries, we doubt it will have much impact on sales of battery-using products in most of the world. Lithium battery makers are glad to explain that. See, e.g., *I/ Lead-Acid: A Polluting and Outdated Technology*, OLENERGIES, <https://www.olenegies.com/en/what-is-lithium/stop-lead-acid-and-conflicts-cobalt-mining/> [https://perma.cc/NV3X-9GJS].

83. Lauren Kelly, *Top 10 Cobalt Producers by Country (Updated 2023)*, INVESTING NEWS NETWORK, <https://investingnews.com/where-is-cobalt-mined/> [https://perma.cc/8RPM-YWTB] (Feb. 23, 2023, 1:50 PM).

more of the refined cobalt market.⁸⁴ The Chinese government is unlikely to support efforts to change the DRC industry that could upset its well-established interests.⁸⁵ Labor abuse in the DRC is among the worst in the mining industry where the mined mineral is used for current decarbonization technologies. The issue is largely ignored in the policy process, in part because there are few good measures for holding producers accountable for such practices. Jennifer Dunn, a chemical and biological engineering professor at Northwestern University, notes that she can calculate the GHG emissions per mile for gasoline powered cars compared to battery-powered cars.⁸⁶ “But when it comes to the social effects [arising from mining in the DRC], we don’t have the same capability for direct comparison. For many engineers, it’s easier to measure or calculate environmental effects than to understand the social conditions in a faraway country that they have never set foot in.”⁸⁷ Other researchers find that the “building back better” agenda to improve the quality of lives for those impacted by cobalt mining in the DRC has had small effect.⁸⁸ Under current environmental policies adopted in the U.S., Europe, and Japan, cobalt and other minerals will be needed in ever larger quantities.

The second major ethical issue in the current approach to decarbonization is environmental destruction in the pursuit of minerals

84. Jack Farchy & Hayley Warren, *China Has a Secret Weapon in the Race to Dominate Electric Cars*, BLOOMBERG (Dec. 2, 2018), <https://www.bloomberg.com/graphics/2018-china-cobalt/?leadSource=verify%20wall> [<https://perma.cc/ZQH7-AYWL>].

85. See Luiza CH. Savage, *How America Got Outmaneuvered in a Critical Mining Race*, POLITICO (Dec. 2, 2020, 4:30 AM), <https://www.politico.com/news/2020/12/02/china-cobalt-mining-441967> [<https://perma.cc/5435-5U2C>] (noting that China owns about half the cobalt production in the DRC). Chinese control of the DRC’s cobalt is increasing as loan payments are forgiven in exchange for more cobalt. See *What China’s Increasing Control over Cobalt Resources in the DRC Means for the West – Report*, MINING.COM (Jan. 17, 2021, 12:56 PM), <https://www.mining.com/what-chinas-increasing-control-over-cobalt-resources-in-the-drc-means-for-the-west-report/> [<https://perma.cc/D2WG-KYRH>].

86. Amanda Morris, *Understanding Cobalt’s Human Cost: Social Consequences of Green Energy Must Be Assessed in Addition to Environmental Impacts, Researchers Say*, NW. NOW (Dec. 17, 2021), <https://news.northwestern.edu/stories/2021/12/understanding-cobalts-human-cost/> [<https://perma.cc/88UF-KY4F>].

87. *Id.*

88. Abbi Buxton, *Mining Cobalt Better*, INT’L INST. FOR ENV’T & DEV. (Sept. 29, 2021), <https://www.ied.org/mining-cobalt-better> [<https://perma.cc/7RGW-DU8P>].

used in batteries and other needed technology.⁸⁹ This can occur in countries where human rights abuse is not a major problem. The issue becomes one of trading off environmental damages in one location in return for environmental improvements in another, such as reduced GHG emissions.⁹⁰ Mining cobalt (like other minerals) has environmental costs, including GHG emissions.⁹¹

Besides the human toll, cobalt mining in the DRC has serious environmental costs. In addition to the air contamination at the mine site, “[c]obalt mining sites also often contain sulfur-containing materials that can generate sulfuric acid when exposed to air and water. When this acid drains from the mines, it can devastate rivers, streams, and other aquatic and terrestrial environments for a very long time.”⁹²

Moving away from the horrors associated with cobalt in the DRC, the industry should consider a mineral used in batteries that is not linked to human rights violations: the confirmed lithium reserves concentrated in Chile and Australia.⁹³ Demand for lithium is expected to rise six to eightfold between 2021 and 2030 as it is also a key battery ingredient; mining and processing must therefore expand rapidly.⁹⁴ EV

89. In the case of the DRC, the human and environmental toll are directly related. Osama Alshantti, *Cobalt Mining in the Democratic Republic of the Congo: The Human and Environmental Costs of the Transition to Green Technology*, SPHERES INFLUENCE (July 22, 2022), <https://spheresofinfluence.ca/cobalt-mining-drc-green-technology/> [<https://perma.cc/V6GB-AST5>]; *DRC: Alarming Research Shows Long Lasting Harm from Cobalt Mine Abuses*, AMNESTY INT’L (May 6, 2020), <https://www.amnesty.org/en/latest/news/2020/05/drc-alarming-research-harm-from-cobalt-mine-abuses/> [<https://perma.cc/G285-GKBM>].

90. As we have argued elsewhere, national borders are arbitrary lines when dealing with environmental issues yet often result in developed countries effectively imposing environmental costs on developing countries. See Andrew P. Morriss & Roger E. Meiners, *Borders and the Environment*, 39 ENV’T L. 141, 180 (2009).

91. There are significant GHG emissions from fossil fuel use in cobalt mining. Shahjadi Hisan Farjana, Nazmul Huda & M.A. Parvez Mahmud, *Life Cycle Assessment of Cobalt Extraction Process*, 18 J. SUSTAINABLE MINING 150, 158 (2019).

92. Christopher McFadden, *The Paradox of “Clean” EVs and the “Dirty” Lithium Mining Business*, INTERESTING ENG’G (Apr. 10, 2021, 12:03 PM), <https://interestingengineering.com/science/clean-evs-and-dirty-lithium-mining-business> [<https://perma.cc/6A55-UZQT>].

93. Argentina, China, and the U.S. are next in confirmed reserves, but Chile and Australia dominate. See Marcelo Azevedo, Magdalena Baczyńska, Ken Hoffman & Aleksandra Krauze, *Lithium Mining: How New Production Technologies Could Fuel the Global EV Revolution*, MCKINSEY & CO. (Apr. 12, 2022), <https://www.mckinsey.com/industries/metals-and-mining/our-insights/lithium-mining-how-new-production-technologies-could-fuel-the-global-ev-revolution> [<https://perma.cc/4WXS-YEEU>].

94. See *id.*

batteries “contain around 8 kg of lithium, 35 kg of nickel, 20 kg of manganese[,] and 14 kg of cobalt.”⁹⁵ Lithium-ion batteries are expected to dominate the EV market “for the foreseeable future.”⁹⁶ Although output in the U.S. is growing, China once again dominates production: in 2021, China produced 79% of all lithium-ion batteries, whereas the U.S. produced only 6.2%.⁹⁷

Much of the lithium used in battery manufacturing in the U.S. comes from Chile, a relatively stable nation with less corruption than most countries with natural resources.⁹⁸ Although few claims of human rights abuses exist in connection to Chilean mining, the environmental damage from lithium mining in Chile appears to be significant—both to air and, even more, to water, as evaporation ponds in mining need large quantities of these materials (in arid areas).⁹⁹

Moreover, producing lithium requires considerable energy use and, as currently produced, results in substantial GHG emissions. Depending on how manufacturers mine and process components and construct the battery, the impact of EVs could even reach net-negative GHG emissions.¹⁰⁰ “The production of an EV battery weighing 500kg

95. Davide Castelvecchi, *Electric Cars and Batteries: How Will the World Produce Enough?*, NATURE (Aug. 17, 2021), <https://www.nature.com/articles/d41586-021-02222-1> [<https://perma.cc/87BG-B4U9>].

96. *Id.*

97. Bhatada, *supra* note 59; Rebecca Bellan, *Michigan Is Becoming the Center of US Battery Manufacturing*, TECHCRUNCH (Oct. 6, 2022, 1:22 PM), <https://techcrunch.com/2022/10/06/michigan-is-becoming-the-center-of-us-battery-manufacturing/> [<https://perma.cc/6DUH-WVFE>].

98. FOTW#1225, *February 14, 2022: From 2016-2019, over 90% of U.S. Lithium Imports Came from Argentina and Chile*, OFF. ENERGY EFFICIENCY & RENEWABLE ENERGY (Feb. 14, 2022), <https://www.energy.gov/eere/vehicles/articles/fotw-1225-february-14-2022-2016-2019-over-90-us-lithium-imports-came> [<https://perma.cc/8BD3-5PBM>]. Transparency International ranks Chile 27 out of 180 nations in corruption, around the same as the U.S. *Corruption Perceptions Index: 2022*, *supra* note 68.

99. See Maeve Campbell, *In Pictures: South America’s ‘Lithium Fields’ Reveal the Dark Side of Our Electric Future*, EURONEWS.GREEN, <https://www.euronews.com/green/2022/02/01/south-america-s-lithium-fields-reveal-the-dark-side-of-our-electric-future#:~:text=Why%20is%20lithium%20extraction%20bad,an%20increase%20in%20global%20warming> [<https://perma.cc/WK58-LLUZ>] (Nov. 21, 2022).

100. Emilie Brooks, *Lithium Extraction Environmental Impact*, ECO JUNGLE (Dec. 31, 2021), <https://ecojungle.net/post/lithium-extraction-environmental-impact/> [<https://perma.cc/ATU7-667J>]; see also Zeke Hausfather, *Factcheck: How Electric Vehicles Help to Tackle Climate Change*, CARBONBRIEF, <https://www.carbonbrief.org/factcheck-how-electric-vehicles-help-to-tackle-climate-change/> [<https://perma.cc/TRP7-3ZJ9>] (July 2, 2020).

emits over 70% more CO₂ than a traditional car in Germany. Overall, lithium extraction and production of electric car batteries contribute to the increase in global temperatures and unpredictable climatic conditions.”¹⁰¹ That is, environmentally, the rush to EVs to deal with carbon emissions from fossil fuels may be ill-advised.¹⁰² By some calculations, using current technology, operating an EV in China or the U.S. means about “6[%] *more* greenhouse gas emissions over its lifetime than does a conventional gasoline vehicle of the same size.”¹⁰³ That is, the environmental bang for the buck may be minimal at best given EV production’s enormous cost: hundreds of billions of dollars that countries should invest in more effective means of reducing GHG emissions.¹⁰⁴

Efforts exist to develop alternative battery technology that avoids the need for cobalt and lithium.¹⁰⁵ Some researchers claim that they can develop battery technologies with much lower environmental cost.¹⁰⁶ Yet, such research is costly and takes time.¹⁰⁷ Given the investment in existing technologies embedded in legislation like the IRA, it is unclear if such research will obtain funding.¹⁰⁸ Major

101. Brooks, *supra* note 100.

102. See Alex Kim, *Lithium: Not as Clean as We Thought*, CLIMATE360 NEWS (Jan. 14, 2022), <https://climate360news.lmu.edu/lithium-not-as-clean-as-we-thought/> [<https://perma.cc/3Q2C-N9AK>].

103. Heather L. MacLean, Alexandre Milovanoff & I. Daniel Posen, *The Electric Vehicle Is Not Enough*, IEEE SPECTRUM, Nov. 2022, at 28, 30. According to one study, the high GHGs result from the higher emissions from mining and manufacturing for EV production compared to gasoline powered cars. *See id.*

104. The cost of EVs alone ignores the costs of the huge increase in the size of the electricity grid that must occur to be able to charge the EVs. See John H. T. Luong, Cang Tran & Di Ton-That, *A Paradox over Electric Vehicles, Mining of Lithium for Car Batteries*, 15 ENERGIES (SPECIAL ISSUE) 1 (2022).

105. Kostiantyn Turcheniuk, Dmitry Bondarev, Vinod Singhal & Gleb Yushin, *Ten Years Left to Redesign Lithium-Ion Batteries*, 559 NATURE 467, 467–68 (2018) (arguing that rising mineral prices due to rapid increase in battery production will force development of less-costly and less-damaging alternatives).

106. Akshat Rathi, *Iron Battery Breakthrough Could Eat Lithium’s Lunch*, BLOOMBERG (Sept. 30, 2021, 5:46 AM), <https://www.bloomberg.com/news/articles/2021-09-30/iron-battery-breakthrough-could-eat-lithium-s-lunch> [<https://perma.cc/BH5D-CWE9>].

107. *See id.*

108. See generally René Kemp, *Technology and Environmental Policy: Innovation Effects of Past Policies and Suggestions for Improvement*, in INNOVATION AND THE ENVIRONMENT: SUSTAINABLE

technology development usually carries a high cost. In the meantime, the rush on producing EVs with existing lithium-ion battery technology creates vested interests in that technology which will become entrenched. Firms that receive subsidies invest in manufacturing existing battery technology and thus do not invest in research into alternatives. The Biden Administration has doled out billions of dollars in grants, and state governments have competed to get such businesses to come to their jurisdictions.¹⁰⁹

Environmental problems from nickel mining are similar to the issues raised by lithium and cobalt. Indonesia dominates nickel production, producing more ore than the next four biggest producers combined.¹¹⁰ Although there are no major reports of human rights violations in Indonesia in mining, environmental damage from mining is an issue. Local companies dig most of the ore, which is processed by Chinese companies.¹¹¹ Forestry researchers report that damage in Indonesia is significant.¹¹² “It results in wide environmental degradation of the mined area and tends to destroy terrestrial

DEVELOPMENT 35 (2000) (describing problems of inducing innovation through investment subsidies for environmental technologies); Chris Ball, George Burt, Frans De Vries & Erik MacEachern, *How Environmental Protection Agencies Can Promote Eco-Innovation: The Prospect of Voluntary Reciprocal Legitimacy*, 129 *TECH. FORECASTING & SOC. CHANGE* 242 (2018) (arguing for new approaches to stimulate innovation in environmental technology); Yafit Lev-Aretz & Katherine J. Strandburg, *Regulation and Innovation: Approaching Market Failure from Both Sides*, 38 *YALE J. REGUL. BULL.* 1 (2020) (analyzing the dynamic between regulation and innovation); Susse Georg, *Regulating the Environment: Changing from Constraint to Gentle Coercion*, 3 *BUS. STRATEGY & ENV'T*, no. 2, 1994, at 11 (discussing the variety of changes made to Danish environmental policy).

109. See Emma Kinery, *Biden Administration Awards \$2.8 Billion in Grants for Electric Vehicle Battery Manufacturing*, CNBC, <https://www.cnbc.com/2022/10/19/biden-administration-awards-2point8-billion-in-grants-for-electric-vehicle-battery-manufacturing.html> [https://perma.cc/J24Y-WN7P] (Oct. 19, 2022, 6:16 PM); Claire Bushey, *Subsidies Spark EV Manufacturing Race in U.S. States*, FIN. POST (Feb. 4, 2022), <https://financialpost.com/commodities/energy/electric-vehicles/subsidies-spark-ev-manufacturing-race-in-u-s-states> [https://perma.cc/5XS4-HLAR].

110. The next four are Philippines, Russia, New Caledonia, and Australia. See Melissa Pistilli, *Top 9 Nickel-Producing Countries (Updated 2023)*, INVESTING NEWS NETWORK, <https://investingnews.com/daily/resource-investing/base-metals-investing/nickel-investing/top-nickel-producing-countries/> [https://perma.cc/4VTY-YXZL] (Feb. 23, 2023, 1:45 PM).

111. See Ian Morse, *Indonesia Has a Long Way to Go to Produce Nickel Sustainably*, CHINA DIALOGUE (May 28, 2021), <https://chinadialogue.net/en/pollution/indonesia-has-a-long-way-to-go-to-produce-nickel-sustainably/> [https://perma.cc/EPT6-KQ2U].

112. Rickys Prematuri, Maman Turjaman, Takumi Sato & Keitaro Tawaraya, *The Impact of Nickel Mining on Soil Properties and Growth of Two Fast-Growing Tropical Trees Species*, INT'L J. FORESTRY RSCH., Nov. 5, 2020, at 1, 1.

ecosystems. Furthermore, it results in the loss of structure and function of soil due to the removal of the top layer of soil, with subsequent reductions in biodiversity and socioeconomic impacts.”¹¹³ The problem is likely to exacerbate as the demand for nickel grows,¹¹⁴ helping to feed needed battery production. Tesla, not wishing to suffer criticism from mining practices in Indonesia, buys its nickel elsewhere.¹¹⁵ “What Tesla wanted was sustainable mining, which was not supported by current [Indonesian] laws.”¹¹⁶ It is unlikely that there are sufficient non-Indonesian supplies to support the massive increase in EVs necessary to meet the IRA and European targets for EV adoption.

Many consumers in wealthy countries, such as the U.S., want green technology, such as EVs and solar panels. At the same time, they do not wish to see environmental damage at home. The result is that the environmentally damaging parts of the green technology supply chain occur out of sight, where we do not see it or even know about it. It is often more damaging to mine minerals in the DRC or Indonesia than in the U.S., since developing countries’ governments are often willing to tolerate more environmental damage. Opening new mines in the U.S. is nearly impossible under current conditions,¹¹⁷ but we are willing to import minerals from around the world without asking too many questions about the environmental consequences. Mining in the U.S., where miners would have to meet high environmental standards, would mean mining would be less damaging than it is in other

113. *Id.*

114. See *Vale Sees 44% Increase in Global Nickel Demand by 2030*, REUTERS (Sept. 7, 2022, 4:46 PM), <https://www.reuters.com/markets/commodities/vale-sees-44-increase-global-nickel-demand-by-2030-2022-09-07/#:~:text=%22Demand%20for%20nickel%20is%20forecast,6.2%20million%20tonnes%20in%20demand> and [<https://perma.cc/U83E-YFPN>].

115. Morse, *supra* note 111.

116. *Id.* (quoting Andry Satrio Nugroho, Inst. for Dev. of Econ. & Fin.).

117. See Jim Vinoski, *Unless We Get Serious About Domestic Mining, America’s Electrified Future Is Impossible*, FORBES (May 31, 2022, 7:58 AM), <https://www.forbes.com/sites/jimvinoski/2022/05/31/unless-we-get-serious-about-domestic-mining-americas-electrified-future-is-impossible/?sh=6a42cb4e17ac> [<https://perma.cc/97TR-SDBJ>].

countries, where few such measures are demanded.¹¹⁸ It would also likely be less costly.

As just one example, consider the fate of the proposed pebble mine in Alaska. In the late 1980s, gold and copper were discovered in a remote but environmentally sensitive location in south central Alaska.¹¹⁹ A company spent ten years doing studies to determine the reserves.¹²⁰ In 2001, a larger company bought the rights and acquired leases from the state.¹²¹ As the possibility of active mining arose, opposition began to mobilize.¹²² The U.S. Environmental Protection Agency finally barred the project in January 2023, after two decades of regulatory proceedings.¹²³ The message to firms thinking of investing capital in mineral development projects in the U.S. is that your funds are at risk; it is better to look to countries where cash is more important than environmental disruption and costly remediation.

As to the supporters of policies promoting EVs and grid-scale batteries: Where do the needed inputs come from?¹²⁴ Are we willing

118. *See id.* Investors are aware that mining in the U.S. is dubious. *See* Vipal Monga & Jacquie McNish, *Battery Metals are Hot, but These Miners Can't Get Investors*, WALL ST. J. (Apr. 23, 2021, 7:00 AM), <https://www.wsj.com/articles/battery-metals-are-hot-but-these-miners-cant-get-investors-11619175601> [<https://perma.cc/G8V6-NQ83>].

119. A timeline may be found in *FACTBOX-History of Alaska's Pebble Mine Project: A Long-Running Saga*, REUTERS (Aug. 25, 2020, 2:46 PM), <https://www.reuters.com/article/usa-alaska-pebblemine-history/factbox-history-of-alaskas-pebble-mine-project-a-long-running-saga-idUSL1N2FR1JK> [<https://perma.cc/SK48-6H8D>] (noting that Republicans in the state maintained their distance from the project due to concerns that the project would damage the hunting and fishing in the area).

120. *See id.*

121. *Id.*

122. *See id.* For an overview by an opponent of the mine, see *A Brief History of Pebble Mine*, UNITED TIMES BRISTOL BAY, <https://www.utbb.org/a-brief-history-of-pebble-mine> [<https://perma.cc/VFU3-HDYY>]. President Trump seemingly encouraged the project while President Biden promised to kill it. *See* Chris Lo, *The End of the Road for Alaska's Pebble Mine Project*, MINING TECH. (Dec. 3, 2020), <https://www.mining-technology.com/features/pebble-mine-alaska/> [<https://perma.cc/E4KF-N6SJ>].

123. *Final Determination for Pebble Deposit Area*, U.S. ENV'T PROT. AGENCY, <https://www.epa.gov/bristolbay/final-determination-pebble-deposit-area> [<https://perma.cc/L8TQ-AB89>] (Feb. 3, 2023).

124. A report from the Finnish government casts doubts on the supply of needed minerals. *See* SIMON P. MICHAUX, GTK MIN. INTEL., ASSESSMENT OF THE EXTRA CAPACITY REQUIRED OF ALTERNATIVE ENERGY ELECTRICAL POWER SYSTEMS TO COMPLETELY REPLACE FOSSIL FUELS 657–58, 666 (2021). Similar questions are raised about solar panels due to the negative environmental impact of creating the

to bear with some unsightly mines knowing environmental rules enforced in the U.S. will better remediate ethical concerns? Or will we leave the production of our car and grid batteries to the children in the DRC and the forced labor camps of China?¹²⁵

III. STRATEGIC ISSUES IN EXISTING DECARBONIZATION POLICY

When legislators and administrators dictate a particular technology to “solve” a problem, the results can be costly and may even be counterproductive. A major example of this was the handling of sulfur oxide emissions in the late 1970s.¹²⁶ Sulfur oxide emissions were a major problem, mostly coming from burning coal to produce power.¹²⁷ Burning high-sulfur coal mined in the eastern states was the primary reason for the emission problem in the eastern half of the country.¹²⁸ The damage was not serious in the West because the West used low-sulfur coal. The national standard for emissions could be easily met in the West.

panels. See Kristina Zagame, *The Environmental Impact of Solar Panels*, ECOWATCH, <https://www.ecowatch.com/solar-environmental-impacts.html> [<https://perma.cc/C5XN-G54X>] (Nov. 29, 2022). They wear out and disposal is a problem due to the toxins. See Atalay Atasu, Serasu Duran & Luk N. Van Wassenhove, *The Dark Side of Solar Power*, HARV. BUS. REV. (June 18, 2021), <https://hbr.org/2021/06/the-dark-side-of-solar-power> [<https://perma.cc/YNR2-HKJH>].

125. See *supra* notes 78–82 and accompanying text; Meiners & Morriss, *supra* note 21, at 37 & n.9.

126. Bruce Ackerman, an environmental law professor at Yale Law School, undertook a detailed investigation of the lobbying, legislation, and EPA rules regarding how emissions from coal-fired power plants were to be “solved.” See BRUCE A. ACKERMAN & WILLIAM T. HASSLER, CLEAN COAL/DIRTY AIR: OR HOW THE CLEAN AIR ACT BECAME A MULTIBILLION-DOLLAR BAIL-OUT FOR HIGH-SULFUR COAL PRODUCERS AND WHAT SHOULD BE DONE ABOUT IT 1–4 (1981). SO₂ emissions are now a tiny fraction compared to what existed four decades ago, but it took decades for the national standard to be met. See *Sulfur Dioxide Trends*, U.S. ENV’T PROT. AGENCY, <https://www.epa.gov/air-trends/sulfur-dioxide-trends> [<https://perma.cc/TH9F-5QH7>] (Aug. 1, 2022).

127. See ACKERMAN & HASSLER, *supra* note 126, at 2.

128. See *id.* at 62–64, 63 fig.1. Southern California had an emissions problem too. See *The Southland’s War on Smog: Fifty Years of Progress Toward Clean Air (Through May 1997)*, S. COAST AIR QUALITY MGMT. DIST., <https://www.aqmd.gov/home/research/publications/50-years-of-progress#Early%20Smog%20Control%20Efforts> [<https://perma.cc/AF2A-NS3W>]. Yet, California emissions were not as bad as emissions in many midwestern and eastern states and were related to vehicle emissions and the (eternal) problem of air being trapped by the mountains east of Los Angeles. See *id.*; Bret A. Schichtel, Rudolf B. Husar, Stefan R. Falke & William E. Wilson, *Haze Trends over the United States, 1908–1995*, 35 ATMOSPHERIC ENV’T 5205, 5206–07 (2001).

“A bizarre coalition of environmentalists and dirty-coal producers tried to exploit congressional ignorance to serve their own, mutually incompatible, purposes.”¹²⁹ The mandated “fix” for the eastern, high-sulfur (dirty) coal problem was smokestack scrubbers to be installed on all coal-burning power plants to catch sulfur emissions.¹³⁰ Environmentalists were happy that emissions would be lowered. The eastern dirty coal interests were happy that their market would not be undercut by clean western coal—scrubbers met the standard. “Thus it made sense for the dirty coal producers to abandon their campaign to weaken pollution standards and take up the cudgels for the costliest possible clean air solution—universal scrubbing.”¹³¹ Environmental groups lauded this action.¹³² Congress forbade the use of “low sulfur coal alone as a means of compliance.”¹³³ The costly technical fix was mandated because it produced the largest political coalition. Further, the dirtiest SO₂-producing plants were allowed to continue producing with higher levels of emissions than allowed of others,¹³⁴ which is why it took decades for the effect of the rules to appear; the full benefit still has not occurred.¹³⁵

129. ACKERMAN & HASSLER, *supra* note 126, at 27.

130. *See id.* at 31.

131. *Id.* This means dirty eastern coal mines that likely would have closed otherwise stayed in business. *Id.* at 31–32. Mine owners, the United Mine Workers Union, and the companies (such as General Electric) that made the scrubbers were happy. *See id.* at 31; Steven J. Marcus, *Acid Rain and Pollution Curbs*, N.Y. TIMES (Nov. 7, 1983), <https://www.nytimes.com/1983/11/07/business/acid-rain-and-pollution-curbs.html> [<https://perma.cc/Z8Q7-8EEM>]. Western electricity producers had to install costly scrubbers too—even though the scrubbers were not needed to meet SO₂ emission standards. Because the scrubber rule applied to all, western producers could not gain a cost advantage over eastern producers. *See* ACKERMAN & HASSLER, *supra* note 126, at 47.

132. ACKERMAN & HASSLER, *supra* note 126, at 36–37.

133. *Id.* at 52 (quoting 122 CONG. REC. H34192 (daily ed. Sept. 30, 1976)). The rules worsened conditions compared to possible alternatives. *See id.* at 62.

134. *See id.* at 68.

135. The dirtiest polluters were still operating—without scrubbers. *See Coal Plants Without Scrubbers Account for a Majority of U.S. SO₂ Emissions*, U.S. ENERGY INFO. ADMIN.: TODAY IN ENERGY (Dec. 21, 2011), <https://www.eia.gov/todayinenergy/detail.php?id=4410> [<https://perma.cc/CP8T-WSPM>]; *see* Eric Lipton, *E.P.A. Rule Change Could Let Dirtiest Coal Plants Keep Running (and Stay Dirty)*, N.Y. TIMES (Aug. 24, 2018), <https://www.nytimes.com/2018/08/24/climate/epa-coal-power-scrubbers.html> [<https://perma.cc/QX4B-J7E4>] (noting that “about 30[%] of the nation’s coal-burning power plant units do not have scrubbers”). These coal-burning plants were grandfathered in, protected from the rules. Lipton, *supra*.

We may be going down this path again by not using either the lowest cost or most environmentally productive ways to reduce GHGs. One strategic issue is whether the current rush to install a massive number of wind turbines and solar panels, and force a move to EVs, is costlier than necessary. The cost is huge, and the resources devoted to the shift have alternative uses in other policy areas—public health, schools, research, etc.—that will have fewer resources because of the mandated spending on the winners in the politically mandated environmental technology. Even within decarbonization policy, alternative technologies for GHG emissions are being largely ignored in federal policy in the rush to favor existing technologies.¹³⁶

Even if the rush for mandated technology is for the environmental best, which is logically impossible to determine because we cannot know today what may evolve over time, the current policy puts China in the catbird seat, even more so than Russia with respect to gas sales to Europe. We do not question the benefits of trade among nations (we are economists!), but we do question the wisdom of relying so heavily on an autocratic regime that is generally accepted as being hostile to the U.S.¹³⁷ to achieve a large part of decarbonization policy.¹³⁸ Surely the example of Europe's dependence on Russian natural gas should serve as a wakeup call to U.S. policy makers.

136. See *Fact Sheet: Biden-Harris Administration Races to Deploy Clean Energy that Creates Jobs and Lowers Costs*, WHITE HOUSE (Jan. 12, 2022), <https://www.whitehouse.gov/briefing-room/statements-releases/2022/01/12/fact-sheet-biden-harris-administration-races-to-deploy-clean-energy-that-creates-jobs-and-lowers-costs/> [https://perma.cc/5LP3-QMZR]. We discuss carbon removal below, but the larger point is that we cannot know what technology will emerge if incentives are provided to encourage new developments, rather than pour most resources into what is known best today, such as solar panels and wind turbines.

137. See, e.g., *A Hostile Meeting Sets the Tone for US-China Relations*, ECONOMIST (Mar. 20, 2021), <https://www.economist.com/china/2021/03/20/a-hostile-meeting-sets-the-tone-for-us-china-relations> [https://perma.cc/W75C-BDNP].

138. See Amy Gunia, *How Rising U.S.-China Tensions May Hurt Efforts to Fight Climate Change*, TIME (Aug. 11, 2022, 10:26 AM), <https://time.com/6205254/us-china-tensions-climate-diplomacy/> [https://perma.cc/L6L3-CF5N].

Significant reductions in GHGs require much more than spending huge sums on solar panels, batteries, and wind turbines in the U.S.¹³⁹ Much of the world is increasing fossil fuel usage, so developing technology to remove CO₂ during fossil fuel use is necessary if we are to reduce the increased levels of GHGs in the atmosphere from developing countries.¹⁴⁰ Notably, the current policy leaves out substantial support for basic research on developing technology to remove carbon from fossil fuels and from the atmosphere.

The largest attempt thus far to decarbonize fossil fuels failed. It was attempted largely on the backs of electric rate payers in the poorest state in the country—Mississippi.¹⁴¹ Called the Kemper project, it “collapsed into a pile of debris, highlighting the strategy of one of the nation’s largest utilities as it aims to decarbonize its fleet.”¹⁴² Mississippi regulators pulled the plug after incurring a couple billion dollars in costs to learn how to remove carbon from coal burned for electricity generation. The U.S. Department of Energy kicked in \$23.5 million, almost after the fact, to study storage of CO₂.¹⁴³ Not surprisingly, other utilities are not rushing to invest in carbon capture technology that would allow continued use of fossil fuels for electricity generation. Their work has continued on carbon capture and storage

139. A huge majority of solar panel production is in China. See *Solar PV Manufacturing Capacity by Country and Region, 2021*, INT’L ENERGY AGENCY, <https://www.iea.org/data-and-statistics/charts/solar-pv-manufacturing-capacity-by-country-and-region-2021> [<https://perma.cc/AQ7Q-K4JJ>] (Oct. 26, 2022). Production capacity in North America is tiny, so the policy is a financial boon to China. See *id.* Wind turbines are marginally better in that regard. Within the U.S., General Electric is the only top ten producer of that technology with six of the other top ten firms in China and three in Europe. *Global Wind Turbine Industry Factsheet 2022: Top 10 Largest Wind Turbine Manufacturers*, BIZVIBE (May 26, 2022), <https://blog.bizvibe.com/blog/energy-and-fuels/top-10-wind-turbine-manufacturers-world> [<https://perma.cc/VS4N-8F8Q>].

140. See Harald Fuhr, *The Rise of the Global South and the Rise in Carbon Emissions*, 42 *THIRD WORLD Q.* 2724, 2729–30 (2021) (describing the increase of CO₂ emissions from less developed countries).

141. See Kristi E. Swartz, *The Kemper Project Just Collapsed. What It Signifies for CCS*, E&E NEWS: ENERGYWIRE (Oct. 26, 2021, 7:11 AM), <https://www.eenews.net/articles/the-kemper-project-just-collapsed-what-it-signifies-for-ccs/> [<https://perma.cc/XAA6-735D>]; Liz Knueven, *The Typical American Household Earns \$61,000 a Year. Here Are 15 States Where the Typical Resident Earns Even Less*, INSIDER: PERS. FIN. (Aug. 19, 2019, 1:00 PM), <https://www.businessinsider.com/personal-finance/poorest-states-in-the-us-by-median-household-income-2019-8> [<https://perma.cc/LDY5-57Z3>].

142. Swartz, *supra* note 141.

143. See *id.*

(CCS),¹⁴⁴ but it has been small-scale to date. There is no Manhattan Project to fund significant research on CCS or even carbon capture from the atmosphere.¹⁴⁵ While some work has been ongoing,¹⁴⁶ federally funded research projects have been small.¹⁴⁷ The IRA focuses on subsidies for existing solar panel, wind turbine, and EV makers.

Let us now recall the favored smokestack scrubbers mandated in the 1970s.¹⁴⁸ As Bruce Ackerman and William Hassler explained, it was neither the least costly nor the most environmentally protective rule that could have been adopted to deal with sulfur emissions from eastern coal-fired utilities. But the technology that was mandated had support from existing special interests: coal mine operators in the East, the United Mine Workers Union, the states in which the mines operated, the utilities facing the reality of having to do something, the makers of the scrubbers, and others.¹⁴⁹ Congress, by the nature of special interest politics, addresses problems by favoring existing

144. For a simple overview, see *What Is Carbon Capture and Storage?*, NAT'L GRID, <https://www.nationalgrid.com/stories/energy-explained/what-is-ccs-how-does-it-work> [<https://perma.cc/9NU3-LJKA>].

145. For an overview of carbon capture and related projects, see Sara Budinis, *Direct Air Capture*, INT'L ENERGY ADMIN. (Sept. 2022), <https://www.iea.org/reports/direct-air-capture> [<https://perma.cc/HL4M-W4XA>]. For an overview of the Manhattan Project, see *Manhattan Project Background Information and Preservation Work*, OFF. LEGACY MGMT., U.S. DEP'T ENERGY, <https://www.energy.gov/lm/manhattan-project-background-information-and-preservation-work> [<https://perma.cc/FLS2-WFSC>].

146. See, e.g., David Chandler, *MIT Engineers Develop a New Way to Remove Carbon Dioxide from Air*, MASS. INST. TECH. NEWS (Oct. 24, 2019), <https://news.mit.edu/2019/mit-engineers-develop-new-way-remove-carbon-dioxide-air-1025> [<https://perma.cc/D85Z-FRJ3>]; Jon Gertner, *The Dream of Carbon Air Capture Edges Toward Reality*, YALE ENV'T 360 (Aug. 25, 2021), <https://e360.yale.edu/features/the-dream-of-co2-air-capture-edges-toward-reality> [<https://perma.cc/4LFC-DN7E>].

147. See Swartz, *supra* note 141; *DOE Announces \$14.5 Million Supporting Direct Air Capture and Storage Coupled to Low Carbon Energy Sources*, U.S. DEP'T ENERGY (Oct. 26, 2021), <https://www.energy.gov/articles/doe-announces-145-million-supporting-direct-air-capture-and-storage-coupled-low-carbon> [<https://perma.cc/BF3E-5DN2>].

148. See *supra* notes 129–35 and accompanying text.

149. An overview is provided in Bruce Yandle, *How Earth Day Triggered Environmental Rent Seeking*, 18 INDEP. REV. 35 (2013).

interests. Members of Congress are, of course, interested in reelection, so they must appeal to special interests.¹⁵⁰

These interests include the companies that import and install solar panels;¹⁵¹ wind turbine makers, including General Electric;¹⁵² electric utilities that have integrated wind turbine technology into their grids; and car makers that have invested heavily in EVs. All these interests knew of the political imperative to reduce GHG emissions.¹⁵³ This political pressure meant something was going to happen, creating an opportunity to gain access to resources. Members of Congress know which special interests will benefit from legislation that insists on specific technology. Supporting research funding to be awarded on a competitive basis, such as for new battery technologies or carbon removal, means the winners are unknown in advance. Unfortunately, this offers little political advantage compared to delivering specific benefits to existing interests.

Even if one accepts the estimates of GHG reductions in the U.S. from the hundreds of billions spent due to the IRA (which are

150. This is not to disparage special interests—it is just the nature of politics. For an example of how forthcoming legislation has reacted to special interests, down to local gas stations and convenience stores, see David Ferris, *The Gas Station's Hidden Battle to Survive*, POLITICO, <https://www.politico.com/news/magazine/2022/10/28/electric-vehicles-fueling-station-gas-utilities-infrastructure-00063398> [<https://perma.cc/H9XY-MC6W>] (Oct. 28, 2022, 3:49 PM).

151. The IRA mandates bring to mind the half-billion-dollar subsidy provided for the solar company Solyndra. See Joe Stephens & Carol D. Leonnig, *Solyndra: Politics Infused Obama Energy Programs*, WASH. POST (Dec. 25, 2011), https://www.washingtonpost.com/solyndra-politics-infused-obama-energy-programs/2011/12/14/gIQA4HIIHP_story.html [<https://perma.cc/S8F4-2FCX>].

152. See *Wind Energy Solutions*, GE RENEWABLE ENERGY, <https://www.ge.com/renewableenergy/wind-energy> [<https://perma.cc/8KKC-GWYL>].

153. Fossil fuel companies are on board with the move to limit GHGs. For examples of fossil fuel companies' discussion of the reduction of carbon emissions, see *Our Business Model*, BP, <https://www.bp.com/en/global/corporate/what-we-do/our-business-model.html> [<https://perma.cc/6XM6-ZJ4S>]; *Lower Carbon Intensity of Our Operations*, CHEVRON, <https://www.chevron.com/sustainability/environment/lowering-carbon-intensity> [<https://perma.cc/84WY-EYJ5>]; Mei Li, Gregory Trencher & Jusen Asuka, *The Clean Energy Claims of BP, Chevron, ExxonMobil and Shell: A Mismatch Between Discourse, Actions and Investments*, PLOS ONE, Feb. 2022, at 1, 2, <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0263596> [<https://perma.cc/SG3B-2WN6>].

themselves highly contested),¹⁵⁴ the impact of these measures on global GHGs will be overwhelmed by increases in emissions from China, India, and other parts of the world where fossil fuel use is increasing and is expected to double in coming decades.¹⁵⁵ Focusing on combatting those increasing emissions is where the biggest bang for the buck in GHG emission reduction must come from, if there is a substantive strategy to reduce carbon emissions.

One hope emerges from the IRA—increased incentives to engage in carbon capture going forward.¹⁵⁶ Unlike subsidies for EVs, solar panels, and wind turbines that further existing technology from known producers, new carbon capture technology will likely emerge from unknown sources. GHG emissions have been falling in the U.S. since 2007 but are still about 6 billion metric tons annually, primarily CO₂.¹⁵⁷ If one accepts the Intergovernmental Panel on Climate Change’s scenario regarding global warming, then the estimated cost per capita, going forward, of each additional ton of CO₂ emitted is

154. For a detailed favorable impact estimate for the U.S., see John Larsen, Ben King, Hannah Kulus, Naveen Dasari, Galen Hiltbrand & Whitney Herndon, *A Turning Point for US Climate Progress: Assessing the Climate and Clean Energy Provisions in the Inflation Reduction Act*, RHODIUM GRP. (Aug. 12, 2022), <https://rhg.com/research/climate-clean-energy-inflation-reduction-act/> [https://perma.cc/ZE2D-MVYJ]; Benjamin Storrow, *How Much Will the Climate Bill Reduce Emissions? It Depends*, SCI. AM.: E&E NEWS (Aug. 11, 2022), <https://www.scientificamerican.com/article/how-much-will-the-climate-bill-reduce-emissions-it-depends/> [https://perma.cc/L4SL-S8QE]; Marc A. Thiessen, Opinion, *The Inflation Reduction Act Won’t Reduce Inflation. Or Climate Change.*, WASH. POST (Aug. 24, 2022, 1:37 PM), <https://www.washingtonpost.com/opinions/2022/08/23/inflation-reduction-act-climate-change-effect/> [https://perma.cc/H5QE-HLZU].

155. In the U.S., coal use for electricity generation fell in half from 2014 to 2020. Tyler Hodge, *U.S. Coal-Fired Generation Declining After Brief Rise Last Year*, U.S. ENERGY INFO. ADMIN.: TODAY IN ENERGY (Oct. 27, 2022), <https://www.eia.gov/todayinenergy/detail.php?id=54419> [https://perma.cc/29AQ-EBX5]. Coal use in Asia is expected to rise significantly. U.S. ENERGY INFO. ADMIN., U.S. DEP’T ENERGY, IEO2021 ISSUES IN FOCUS: UNCERTAINTY IN COAL TRADE IN INDIA AND GREATER SOUTHEAST ASIA 3 (2022), https://www.eia.gov/outlooks/ieo/IIIF_coal/pdf/IIIF_coal.pdf [https://perma.cc/63NV-XHT9].

156. See generally BIPARTISAN POL’Y CTR., INFLATION REDUCTION ACT SUMMARY: ENERGY AND CLIMATE PROVISIONS (2022), https://bipartisanpolicy.org/download/?file=/wp-content/uploads/2022/08/Energy-IRA-Brief_R04-9.26.22.pdf [https://perma.cc/EGC6-BZK7] (providing a summary of the key energy provisions of the IRA).

157. See *Climate Change Indicators: U.S. Greenhouse Gas Emissions*, U.S. ENV’T PROT. AGENCY, <https://www.epa.gov/climate-indicators/climate-change-indicators-us-greenhouse-gas-emissions> [https://perma.cc/SP5B-AX2G] (Mar. 24, 2023).

estimated to be \$185.¹⁵⁸ Multiply that by 6 billion and you have more than \$1 trillion in cost—for emissions from the U.S. alone. For global emissions, multiply the numbers by at least six.¹⁵⁹ To change that, significant new technology must emerge.

The IRA increases the available CO₂ sequestration tax credit, depending on the source, going forward.¹⁶⁰ Referred to as 45Q incentives from the section of the U.S. Code where they appear, tax credits rise from \$50 to \$85 per ton when industrial and power generation are involved in carbon capture.¹⁶¹ Advocates assert this creates significant incentives for an array of producers to invest in carbon capture.¹⁶² If so, it could be significant, but the credits are far less than the estimated cost imposed by GHG emissions.

CONCLUSION: WE NEED AN ALTERNATE STRATEGY

When World War II ended and much of Europe was in ruins, the U.S. provided significant economic assistance to European countries through the Marshall Plan and other programs that helped Europe rebuild.¹⁶³ The plan was not pure charity but raised major strategic concerns; the U.S. feared that Europe could go Communist and, even if European countries did not, improving European economies meant more profitable trade markets for American firms.¹⁶⁴ This policy was both strategic and ethical.

158. Kevin Rennert, Frank Errickson, Brian C. Prest, Lisa Rennels, Richard G. Newell, William Pizer, Cora Kingdon, Jordan Wingenroth et al., *Comprehensive Evidence Implies a Higher Social Cost of CO₂*, 610 NATURE 687, 689 (2022).

159. See Hannah Ritchie & Max Roser, *CO₂ Emissions*, OUR WORLD DATA, <https://ourworldindata.org/co2-emissions> [<https://perma.cc/89KV-DQKA>].

160. For details, see 26 U.S.C. § 45Q; BIPARTISAN POL'Y CTR., *supra* note 156, at 9–10.

161. BIPARTISAN POL'Y CTR., *supra* note 156, at 9; Matt Bright, *The Inflation Reduction Act Creates a Whole New Market for Carbon Capture*, CLEAN AIR TASK FORCE (Aug. 22, 2022), <https://www.catf.us/2022/08/the-inflation-reduction-act-creates-a-whole-new-market-for-carbon-capture/> [<https://perma.cc/F2L9-TNMR>].

162. See Bright, *supra* note 161. There are an array of prices by industry and certain special interest conditions must be met, such as paying “prevailing wages.”

163. For an overview of the Marshall Plan, see *Marshall Plan, 1948*, OFF. HISTORIAN, <https://history.state.gov/milestones/1945-1952/marshall-plan> [<https://perma.cc/9D36-ZYQG>]. Over \$12 billion was spent through this plan. *Id.* Adjusting for inflation, that would be about \$150 billion today.

164. See *id.*

Most carbon reduction strategies depend on minerals mined in the DRC and other places where human rights abuses are common and the environment is not protected. Mining is nearly forbidden in the U.S., but we are willing to buy minerals mined in dreadful conditions as we export our demand for products to other locations. Two strategic issues exist in the current carbon reduction policy: first, the dubious wisdom of near sole-source reliance on finished inputs from China; and second, the lack of investment in a wider array of technologies that could remove carbon from fossil fuels or remove it from the atmosphere. Such technology is likely to be costly and may be something we should give away to other countries to help them reduce GHG emissions. Providing subsidies for existing technologies is not defensible because these technologies benefit only special interests while produce high-cost minimal gains in reducing global carbon load. Carbon capture offers more hope as a strategic initiative that will produce environmental gains and involve far fewer ethical challenges. New technologies, yet unknown, may as well. Creating incentives for developing decarbonization strategies that reduce the U.S.'s dependence on China and eliminate the use of minerals grubbed by children in the DRC is in all our interests.