

Primer: Green Industrial Strategy for Just Transitions

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PATRICK BIGGER Climate and Community Project

JESSE STRECKER University of California, Berkeley

Report by A.L. McCullough

Climate and Community Project is a progressive climate policy think tank that mobilizes a network of leading academic and movement researchers in developing cutting-edge research at the climate-inequality nexus. We've produced multiple research briefs alongside movement and political partners including the Green New Deal for Public Schools, and High Roads to Resilience, and Achieving Zero Emissions with More Mobility and Less Mining.

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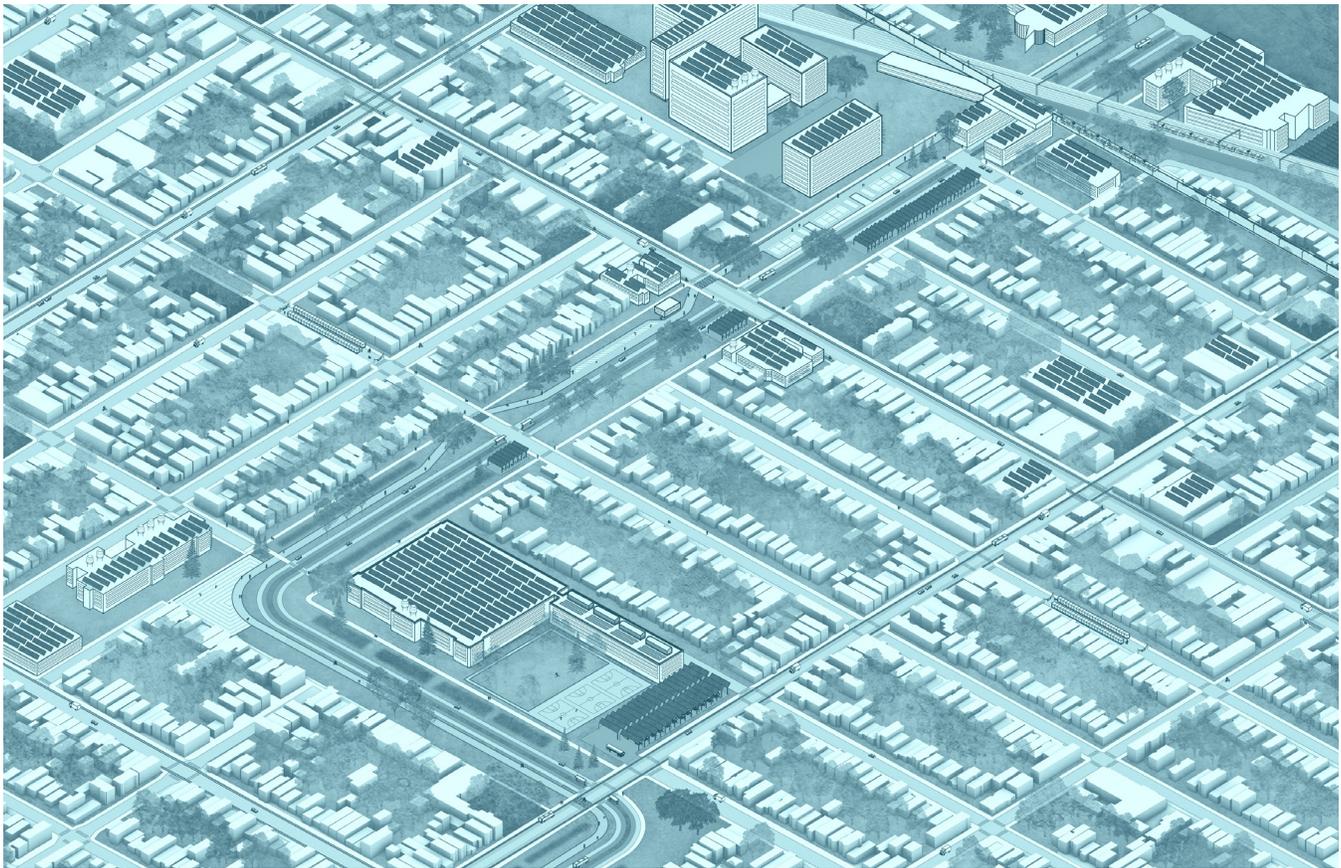
The return to industrial policy reflects a shift in attitudes about the appropriate role of government in identifying and achieving desirable outcomes

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After forty years of neoliberal environmental and economic policy ascendancy, industrial policy is back at the center of agendas around the world. In the US, industrial policy (in fact, if not in name) has been taken up by both parties at the federal level, signaling appetite for more direct and higher-profile state intervention in wide swathes of the economy. **The return to industrial policy reflects a shift in attitudes about the appropriate role of government in identifying and achieving desirable outcomes;** over the neoliberal era, one of the guiding mantras was that the state should not pick winners and losers except in limited, but significant economic sectors, particularly the military-industrial complex. The results of this fixation on limited state intervention in the economy are clear: productivity has stagnated, just-in-time supply chains have broken down, manufacturing capacity has been lost, climate change is more or less unabated, and moreover, long standing social problems of racial and class inequality are as bad as ever. Green industrial strategy (GIS) and its subsidiary policies is an organizing principal that can use the power and resources of government to remake the economy in ways that correspond to the needs and aspirations of communities around the country while contending with entrenched social and environmental problems.

Contending with climate change in a way that facilitates just transitions to a post-fossil fueled, warmer world while unpicking the damages wrought by neoliberalization will be an enormous challenge. To take this challenge on, the time is ripe for governments—national, state, and municipal—to forge green industrial strategy, or a comprehensive suite of coordinated policies that seek to achieve overarching coherent, complementary outcomes across economic sectors. The primer proceeds in two main sections. The first half summarizes green industrial strategy as a concept and some of the main considerations for designing and evaluating individual policies. The second half offers a high-level overview of some of the policies, on a sector by sector basis, that can be thought of as comprising a de facto green industrial strategy—although one that is so far piecemeal, and will continue to require concerted movement support to improve the cohesion and social, economic, and environmental outcomes for communities and constituencies who need it most.

In contemporary political economy, industrial strategy must inextricably be linked with debates on the climate crisis—indeed, the growth of industrial policy discourse tracks with increasing urgency to act. As a ‘super wicked problem’ with drivers enmeshed in all aspects of the economy, the climate crisis requires bold action and more confident use of state authority and resources.¹ Todd Tucker of the Roosevelt Institute argues that industrial policies



and planning represent a horizontal lever of state power, “influenc[ing] the allocation of labor and capital among the over 1,000 industries in the economy—encouraging some activities and discouraging others.”² In our view, **good green industrial policies use state fiscal and regulatory authority to grow the high-road industries we want to see in our future, promotes a just transition away from damaging and exploitative industries, and balances tradeoffs and conflicts between different sectors and workers to facilitate a new economy.** The private sector and extant regulations have failed to bend the emissions curve significantly enough to stay on track for the 1.5-degree climate target of the Paris Agreement.³ The urgency of the climate emergency is leading to widespread recognition that more interventionist approaches are required.⁴

This is evidenced not only by the popularity of Green New Deal-aligned policy proposals that clearly fall under a rubric of green industrial policies, but a clear-headed look back at the continued, widespread, and more effective use of command-and-control regulations and state subsidies that have typified environmental policy—even over the course of the neoliberal era. While state and supranational cap-and-trade programs, market-based credit systems for renewable power and fuels production, and public-private partnerships have been much discussed, emissions standards, direct government subsidies, and other public spending and quota-based regulatory approaches have done the lion’s share of achieving environmental policy priorities, bringing new technologies to market, and promoting the adoption of those technologies—all while (however insufficiently) taking equity and labor considerations into account.

1. Kelly Levin, Benjamin Cashore, Steven Bernstein, Graeme Auld, “Overcoming the tragedy of super wicked problems: constraining our future selves to ameliorate global climate change,” *Policy Sciences* 45 (2012): 123–152, <https://doi.org/10.1007/s11077-012-9151-0>.

2. Todd Tucker, “Industrial Policy and Planning: What It Is and How to Do It Better,” Roosevelt Institute, July 30, 2019, <https://rooseveltinstitute.org/publications/industrial-policy-and-planning/>.

3. IPCC, “FAQ Chapter 1,” IPCC, accessed April 15th 2023, <https://www.ipcc.ch/sr15/faq/faq-chapter-1/>.

4. Jonas Meckling and Jesse Strecker, “Green bargains: leveraging public investment to advance climate regulation,” *Climate Policy* (2022), <https://doi.org/10.1080/14693062.2022.2149452>.

AIMS OF GREEN INDUSTRIAL STRATEGY

Despite a swelling literature and increasing willingness among policymakers and commentators to name state investment, regulations, and other market interventions as industrial policy, competing perspectives on what industrial policy is, or ought to be, remain. In our view, Green Industrial Strategy, and subsidiary policies, should be guided by three key principles:

1. Targets public investments to low-income communities, frontline communities, and communities of color to redress harms and build more robust futures.
2. Links public investments and subsidies to private businesses with sectoral and economy-wide climate targets to ensure policy carrots lead to emissions reductions rather than simply increasing green economic activity alongside legacy activity.
3. Couples public investments and benefits to private businesses with equity and labor requirements to promote community resilience and nurture coalitions of labor, racial and environmental justice groups.

In line with these principles, **green industrial policies are distinct from market-based approaches to climate change.** Since at least negotiations on the Kyoto Protocol in the early 1990s, market-based mechanisms have dominated debates around policy design to reduce emissions and mitigate the impacts of climate change. In the late 2000s, the United States was poised to embrace a market-based approach to climate policymaking. The American Energy and Security Act of 2009, usually referred to simply as the Waxman-Markey bill, included an emissions trading scheme modeled on the program launched by the European Union in 2005. Yet, after Waxman-Markey failed to pass the Senate, Federal climate policy settled into a now-familiar holding pattern that was premised primarily on tax incentives with a smattering of industrial policy-aligned experiments, especially for research and development funding and limited investment in priority sectors through loan guarantees and other financial enhancement mechanisms, particularly in renewable energy and biofuels.

The Inflation Reduction Act does not represent a paradigmatic break with this holding pattern, but rather its escalation—with a few notable exceptions, like direct pay for non-profit and government renewables deployment, or increasing (if still insufficient) commitments to invest in Environmental Justice communities. That is, contemporary Green Industrial Strategy still cleaves to the logic of what Daniela Gabor termed ‘the Wall Street Consensus’, or the overriding belief that the primary role of state investment is to ‘de-risk’ or otherwise subsidize private investment into

industries identified as public policy priorities.⁵ As such, we consider the Inflation Reduction Act something of a midway point toward articulating and deploying Green Industrial Strategy, riddled as it is with half-measures and giveaways to incumbents, but one that points the way toward more bold, public-investment-forward modalities in the future.

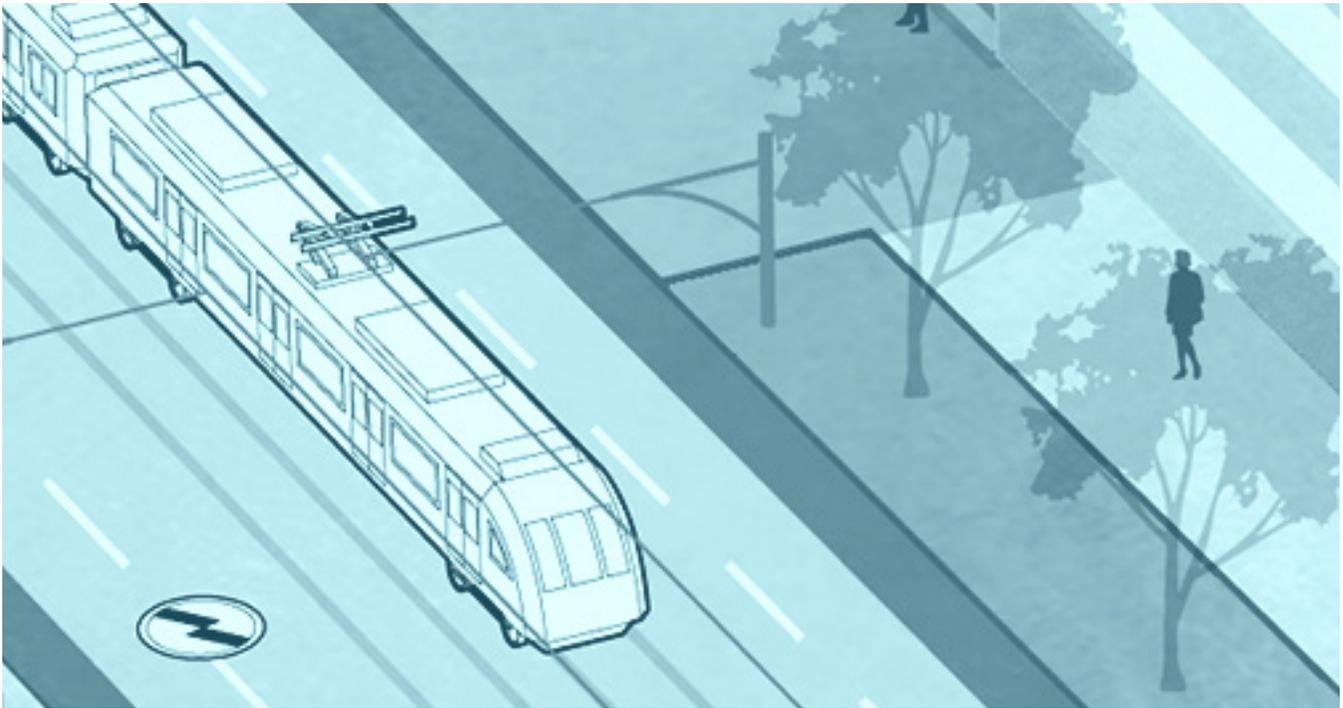
In the US states, high profile market-based mechanisms to contend with climate change also gained traction in the mid-2000s. The northeastern states of the Regional Greenhouse Gas Initiative were the first to adopt a cap-and-trade system for electric power sector emissions, followed by the roll out of California’s economy-wide cap and trade system in 2014. Yet, despite the prominence of market-based mechanisms in the policy discourse, green industrial policies outnumber market-based climate policies by an overwhelming margin.⁶ As of 2017, 132 jurisdictions globally had adopted regulations we would characterize as green industrial policies aimed at decarbonizing the electric power sector, such as renewable portfolio standards, while only 52 had adopted market-based policies. Similarly, in transportation, 99 jurisdictions had green industrial policies on the books, such as electric vehicle incentives, with just 12 adopting market-based policies. Even in California, known globally as an early adopter of a carbon emissions trading scheme, the state’s cap-and-trade system only accounts for a fraction of the state’s emissions reductions (7% between 2015 and 2020),⁷ with green industrial policies and other programs and regulations like car and appliance efficiency standards, investment in combined heat and power, and state clean-procurement laws, among dozens of others, accounting for the remainder. In short, we can understand the policy suite of non-market rules comprising a combination of command-and-control regulations with direct state investment (and a huge amount of private sector and consumer-facing subsidies) and more concerted public steering of private investment.

In California as elsewhere, **green industrial policies pre-dated market-based policies and outperform them as well**—with potential to drive deep decarbonization in ways that maximize social benefits. One primary

5. Daniela Gabor, “The Wall Street Consensus,” *Development and Change* 52, vol. 3 (2021): 429-459, <https://doi.org/10.1111/dech.12645>.

6. Jonas Meckling, Tomas Sterner, and Gernot Wagner, “Policy sequencing toward decarbonization,” *Nature Energy* 2 (2017): 918-922, <https://doi.org/10.1038/s41560-017-0025-8>.

7. Amber Mahone, “Cap and Trade and Complementary Climate Policies in California: AB32 and Beyond,” Lecture, Washington DC, January 28, 2015, https://www.nacarbon.org/meeting_ab_presentations/2015/2015_Jan28_AM_Mahone_160.pdf.



reasoning for this pattern of policy sequencing is the distinct political logics of the two approaches. Unlike market-based mechanisms, **green industrial policies confer concentrated benefits on certain economic actors and communities**, helping, for example, to grow the solar installation industry, or supporting automakers to develop new technologies such as electric vehicles. Thus far, most of these concentrated benefits have fallen at the feet of capital, and to a lesser extent labor, but have often failed to deliver for low-income communities, communities of color, and communities overburdened with the toxic legacies of fossil and industrial pollution.

Politically, concentrated benefits tend to make green industrial policies significantly more feasible than market-based policies, which, without significant regulation that gives lie to the notion these policies are market-like at all, stand in contrast to the oft-repeated notion that market-based policies are more politically palatable than industrial strategy alternatives. While many jurisdictions that have made more progress on climate have ultimately adopted market-based mechanisms, this is generally only done after green industrial policies create concrete tangible economic benefits in the forms of new investments and green jobs—demonstrating the overarching imperative to design climate policies that make tangible differences in peoples’ everyday lives in the hope of building support for even stronger actions down the line.

Meanwhile, **the neoliberal approach to climate policy places the unguided, indiscriminate stick of market discipline front and center.** This approach

to climate policy makes emissions reductions feel like austerity (and allows opponents of climate action to frame these regulations as attacks on working people) by reducing aggregate consumption. In their simplest forms, carbon taxes and emissions trading schemes act to raise the price of energy, ultimately making basic goods more expensive. This essentially serves as a tax on consumption, regressively born by the people and communities on the lowest incomes; while jurisdictions have tinkered with ways of making these regulations less regressive, they end up with a Rube Goldberg-esque policy architecture that saps staff time and is incomprehensible to most people—limiting support for further climate action.

CARROTS AND STICKS

On the other hand, the policies that comprise a robust green industrial strategy can be designed in ways that explicitly create tangible benefits for low-income workers, communities of color, and the people and places facing the worst consequences of our current fossil-fuel-fired economy.

One major challenge of green industrial strategy, however, is that **carrots alone cannot guarantee emission reductions, let alone full decarbonization.** The investment carrots most common to US green industrial policies thus far must be coupled with quantitative emissions reductions goals and enforceable regulations to ensure they are met. Incentives and enforcement options can be designed in ways for either co-implementation (e.g., meeting goals unlocks further incentives) or

independently of one another (e.g., cap-and-invest where industry-wide and emitter specific emissions targets must be met regardless of state investment strategy).

The tools that states can deploy through either of these overriding industrial strategy modalities are diverse and growing. First, there are the investment vehicles and ways of funding them, and second, the investment targets themselves. For example, the proposed New York Build Public Renewables Act would leverage state utility ownership and associated lower cost financing to meet the state's ambitious renewable energy capacity. There are near infinite combinations of investment vehicles and investments, using green bond financing, equity stakes, public-public or public-community partnerships, revolving loans, targeted and block grants, or consumer subsidies that escalate with need to invest in energy, housing, public and private electrified transportation, green chemistry breakthroughs, public lands restoration, or social/healthcare infrastructure.

Through any combination of these vehicles and investments, the state is explicitly picking 'winners and losers.' This phrase was used pejoratively by mainstream economists and their political acolytes throughout the neoliberal era, but it has become abundantly clear that the use of market-based policies has always been about picking winners. **These winners have tended to be industry incumbents and capital writ large as business-as-usual has proceeded largely unabated while the (marginal) increased production costs have been passed, regressively, to consumers and communities.** The flipside is that the losers have been working and middle-class communities, public services, and the environment. **Green industrial strategy offers a path toward the democratic identification of who should win in the transition to a lower emitting, but warmer world.**

The use of these investments will help promote winners—technologically, organizationally, and geographically—but sticks must be designed to ensure we wind down the industries and industrial processes that are driving us to lose on climate.⁸ These sticks can come in the form of quantitative emissions targets for the entire economy and specific industries, outright bans on harmful practices (in an array of registers, from production to labor

standards), stronger permitting and permit-renewal criteria, improved funding for enforcement agencies and enhanced reporting measures to ensure compliance with existing regulations, efficiency standards, zoning regulations, and more. **To date, the US Federal government's industrial policies vis climate have been much stronger on the carrot side of the equation, while states have been at the forefront of experimenting with emissions reductions tools and enforcement.** Given Federal gridlock, this arrangement is likely to continue in the short to medium term— money from the IRA, the Infrastructure Investment and Jobs Act, recent use of the Defense Production Act,⁹ and likely other, smaller initiatives, will be disbursed over the next 10 years, directly and to states, for public investment in climate solutions; however, it will be up to the states to pair investment with regulations that drive disinvestment in harmful sectors and processes while achieving critical environmental and racial justice priorities.

WHAT CAN GREEN INDUSTRIAL STRATEGY DO?

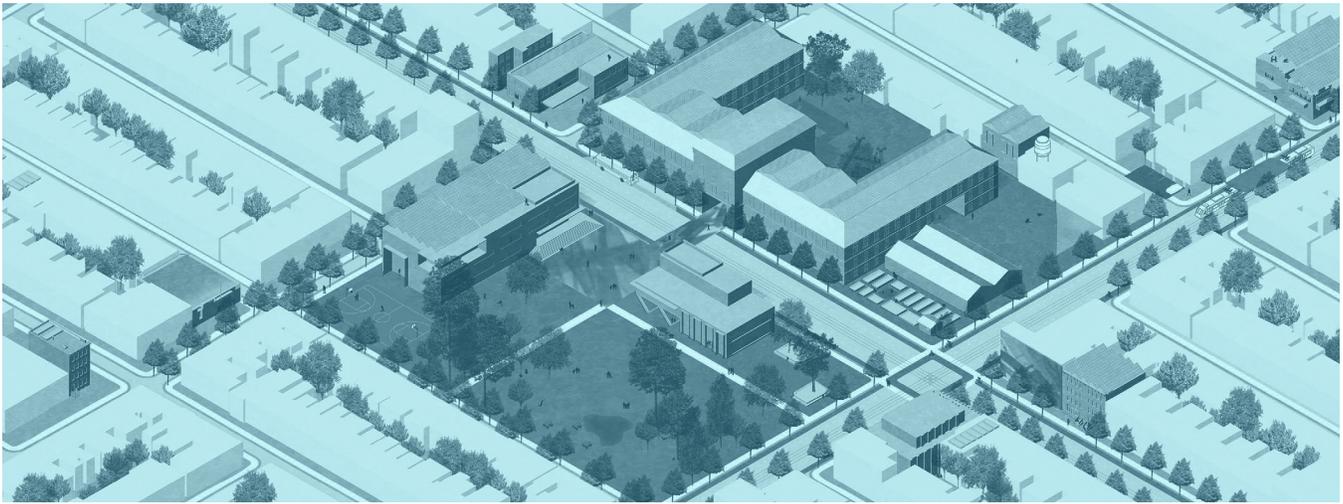
In contrast to market-based mechanisms to achieve economic, social, and environmental goals, GIS can guide long-term decision making in ways that create immediate, targeted benefits for important communities while building a durable, safer future by locking-in desirable infrastructure and production capacity. In the first instance, green industrial policies offer clearly defined pathways for coordination between the state and markets in ways that neoliberal price mechanisms cannot; for example, cap and trade may reduce aggregate emissions in a jurisdiction, but by necessity it is ambivalent about what increasingly scarce emissions should be used to produce; as Romain Felli puts it, "Whether scarce resources are used to produce ice cream for dogs or build hospitals is beside the point. The indifference rests, of course, on the assumption that a free market will allocate resources efficiently."¹⁰

In practice this has meant that the gargantuan Chevron refinery in Richmond, CA continues to dump pollutants into neighboring communities that already environmental justice 'hot spots' while producing harmful fuels that promote automobility lock-in across the state—despite the fact that the facility is covered by

8. Mark Paul and Lina Moe, "An Economist's Case for Restrictive Supply Side Policy: Ten policies to manage the fossil fuel transition," Climate and Community Project, March 2023, <https://www.climateandcommunity.org/economists-case-end-fossil-fuels>.

9. "MEMO: Biden's Defense Production Act Order and Four Key Ways to Ensure Supply Chain Justice," Climate and Community Project, April 2022, <https://www.climateandcommunity.org/dpa-supply-chain-justice>.

10. Romain Felli, "Environment, not Planning: The Neoliberal Depoliticisation of Environmental Policy by means of Emissions Trading," *Environmental Politics* 5, vol. 24 (2015): 641-660, <https://doi.org/10.1080/09644016.2015.1051323>.



the state's cap-and-trade market. The Richmond case is also instructive for understanding the importance of both state regulation and well designed federal incentives, as Chevron is now trying to pivot from maintaining the refinery as-is to retrofitting it to produce 'blue hydrogen,' a natural gas byproduct that would continue to be produced adjacent to long overburdened communities. A green industrial strategy approach that couples targeted emission reductions with investments in public transit and EV infrastructure could more rapidly phase out the emissions currently damaging Environmental Justice communities.

Green industrial strategy also offers states an opportunity to coordinate with one another rather than reproducing the 'entrepreneurial,' beggar-thy-neighbor industrial policy making that has typified the neoliberal era. Extant state policy for attracting manufacturing and other jobs has largely revolved around a zero-sum understanding of economic development, encouraging the use of tax incentives, low-road labor standards, and publicly funded infrastructure to poach jobs from other states. Coordinated industrial strategy can take a more synthetic approach to supply chains, manufacturing, and transportation by identifying complementary strengths and needs for investment while facilitating detente in the spatial competition to grow the green economy and helping accelerate the overall growth of green industries. This process is already underway in the Midwest, as several states have signed up to an agreement not to use tax incentives to lure corporate headquarters from one another, but there are proposals for more ambitious multi-state formations like The Great Lakes Authority that could be retooled in light of potential funding coming down from the Federal level.¹¹

11. Natasha J. Fernández-Silber, "Making the Rust Belt Green Through a Federal Great Lakes Authority," Detroit Democratic Socialists of America, Feb 15, 2019, <https://detroit socialist.com/making-the-rust-belt-green-through-a-federal-great-lakes-authority-a548a5d46b44>.

Green industrial policies could also simultaneously guide investments into marginalized communities, while acting as a bulwark against ascendant eco-fascism. Reactionary, anti-democratic violence is often driven by deteriorating material conditions, especially for groups (e.g., industrial-laboring white men) that have historically enjoyed privileged positions in the economy. Meanwhile, communities of color, immigrants, and, increasingly, derelict first-ring suburbs suffer long-standing—and in many cases escalating—economic and environmental burdens. Green industrial strategy can contend with both sides of this coin by driving investment in a diverse array of places, helping to foster an understanding that tangible outcomes, such as good jobs, cheaper, reliable energy, and secure homes can come from climate policy—hopefully creating an appetite for more. Implementing green industrial policies at a scale will deliver real material benefits to both groups, offering important evidence that this strategy can raise all boats in a way that market policies never could.

THE GREEN INDUSTRIAL STRATEGY TOOLBOX

The conventional tools of green industrial strategy resemble those of standard industrial policy. These include **low interest loans** for the development of emerging technologies, such as the Department of Energy loans that helped Tesla emerge as a market leader, **subsidies** such as the investment and production tax credits that have helped dramatically grow the renewable energy installation industries in the US, **direct investments** in enabling infrastructure such as electric vehicle charging stations, and trade policies such as tariffs or anti-dumping rules for green goods such as solar panels. In addition to these conventional industrial policy tools, **regulations** that require the use of certain environmentally beneficial technologies, such as renewable portfolio standards, also constitute green industrial policies because they grow the market for these green goods and services. A green

industrial strategy approach can and should flow into other areas of policymaking, such as public **procurement**, as states have begun adopting Buy Clean standards for materials purchased for public construction projects, especially in hard-to-decarbonize industries like cement and steel.

Internationally, green industrial policies also include approaches traditionally deemed too interventionist for the United States, such as **equity purchases, public provision of green goods and services, and financing green technologies via public banks**, and other, more direct interventions like price controls and wage boards that have been proposed in light of the economic turbulence of the last year. Nevertheless, some states and municipalities are now adopting some of these more transformative approaches. To return to New York's Build Public Renewables Act,¹² the law aims at scaling up the nation's largest publicly owned electric utility to provide 100% renewable energy at affordable rates, prioritizing service to low-income communities; a robust national green industrial strategy would expand this approach to the federal government.¹³ In California, debate continues around proposals for the state to take over the Pacific Gas & Electric Company.¹⁴ Meanwhile, at least five states and one municipal government have recently initiated public banking programs aimed at offering low-cost capital to green projects, a trend that may accelerate depending on how rulemaking shapes the deployment of the federal Greenhouse Gas Reduction Fund authorized by the Inflation Reduction Act.¹⁵ These and other proposals are pushing the envelope of what kind of state interventions are politically feasible in the United States.

WHOLESALE AND INCREMENTAL STATE GREEN INDUSTRIAL POLICIES

Getting to a regulatory architecture we might characterize as green industrial strategy with subsidiary green industrial policies is unlikely to occur overnight in states where the approach has not been adopted yet, although it is not inconceivable in states with shifting political compositions. Instead, there are two paths to

green industrial strategy. The wholesale approach enabled by a strong, binding framework law that sets ambitious emissions reductions and social equity targets is one, but there are piece-meal, industry-by-industry pathways available as well. States like California and New York have strong climate framework laws that mandate state action in tandem with ambitious climate goals, but even in these first-mover jurisdictions increasingly strong policy interventions are needed to achieve those goals. Green industrial strategy should drive ambition forward as well as prevent backsliding or stagnation through forward looking goals with binding intermediate targets as evidenced by recent gas tax subsidies in California.¹⁶

In states that lack a strong framework law, individual industrial policies may best be pursued through targeted objectives that start with priority industries and communities. These strategies, by necessity, will be tailored to local movement strengths and pressing social, economic, and environmental issues—for example, Louisiana has one of the most robust plans and funding streams in the nation for climate adaptation because of deteriorating environmental conditions, far beyond plans and interventions undertaken by neighboring states. The piecemeal approach is also likely the only path available in states with divided government, or even legislative majorities *prima facie* hostile to climate action; here, executive orders, ballot initiatives, and creative legislative approaches will be the key tools to advance combined social and environmental objectives.

Investments to drive climate ambition and create the political conditions for green industrial strategy align neatly with the other Green New Deal-linked objectives, like democratizing ownership and building public sector capacity in concert with labor and racial justice movements. First, the state's capacity to provide democratic energy governance is unparalleled, but it will require the explicit provision of public options. Sticks like renewable portfolio standards have been important tools to drive the buildout of renewables thus far, but as Brett Christophers recently demonstrated, widespread renewables buildout is antithetical to incumbent energy

12. "The Bill," Public Power NY, accessed April 15th, 2023, <https://publicpower.ny.org/legislation/>.

13. Johanna Bozuwa, Sarah Knuth, Grayson Flood, Patrick Robbins, and Olufemi O. Taiwo, "Building Public Renewables in the United States," Climate and Community Project, March 2023, <https://www.climateandcommunity.org/public-renewables-in-the-us>.

14. "About Us," Reclaim Our Power! Utility Justice Campaign, accessed April 15th, 2023, <https://reclaimourpowerca.org/about/>.

15. "Green Banks," NREL, accessed April 15th, 2023, <https://www.nrel.gov/state-local-tribal/basics-green-banks.html>.

16. Grace Gedy, "This is How Much Money You'll Get from the California Gas Rebate," *Cal Matters*, October 14, 2022, <https://calmatters.org/economy/2022/10/california-gas-rebate-4/>.

firms' and their financiers' business strategies—leaving states, cities, and other public entities to fill in the gaps.¹⁷ Municipal and state-owned renewables, transportation systems, housing, telecommunications infrastructure, and more, must become credible options, but movements will have to work hard to shift narratives about how public services should be run—that is, as services that benefit communities rather than cost-centers that should be made to be run like profit-maximizing businesses.

Green industrial strategy and individual policies absolutely must offer tools to build labor power throughout the economy. More robust industrial policies can and should include high-road labor provisions that enable workplace democracy, and mandate prevailing wage, community workforce agreements, skills standards, and/or preferential bidding criteria. The tide of public opinion is very much shifting toward labor with approval for unions soaring, especially among young people—this shift is beginning to pay policy dividends, as seen by the recent repeal of right to work laws in Michigan, but explicitly collaborating with labor, and building strong labor protections in industrial policy is critical for building durable, winning coalitions.

Critically, green industrial strategy is a public-investment forward approach to making a green economy, and as such, requires revenue to reinvest. **Any campaign for green industrial policies that seek to leverage state resources, as opposed to just redirecting federal funds, will have to contend with the revenue side** either through twinned revenue and expenditure measures or through each separately. Movements in Michigan are currently experimenting with the twinned approach, aiming to reform state income tax into a progressive taxation regime with revenue explicitly tied to the creation of a Great Lakes Trust Fund. A range of other revenue options must be on the table to get green industrial policies up and running, but they must begin with the premise that they are stable, predictable funding streams that can continue to support just transition measures over the long haul—relying on gas taxes to fund the transition is going to run out of road if the transition is actually progressing at the needed clip. Revenue can and should be supplemented with debt and private investment where appropriate, but ultimately both sides of the income/investment ledger will have to grow precipitously.

Individual green industrial policies are growing in mainstream appeal, but progressive changes to state-market relations won't be won by ideas alone. The most effective strategies to change public investment priorities, and broader state-market and state-firm relations, will depend on increasingly vibrant and strategic organizing led by racial justice organizations, environmental justice campaigns, labor unions and other formations. For green industrial strategy to gain further traction, it will be strategic to develop ideas and proposals that are sound from a political economy standpoint, and around which it will be possible to build organizing campaigns tailored to the material needs of communities and the objectives of movement leaders. Doing so will create a living interface between mobilization, policy development, policy deployment, investment, and material benefits, ultimately creating a virtuous policy/investment cycle as communities get tangible evidence that this approach will improve their lives.

17. Brett Christophers, "Taking Renewables to Market: Prospects for the After-Subsidy Energy Transition," *Antipode* 5, vol. 54 (2022): 1519-1544, <https://doi.org/10.1111/anti.12847>.

GREEN INDUSTRIAL POLICIES BY SECTOR

ELECTRICITY

As the low-hanging fruit of decarbonization, the electricity sector has been the most fruitful site of industrial policy experimentation. **Renewable portfolio standards** are the primary policy lever states have used to drive the deployment of renewable energy technologies. These policies promote installation of renewables, seeking to expand the renewable installation industry, and indirectly, renewables hardware manufacturing—federal manufacturing incentives through IRA and DPA are aiming to bolster that with more direct subsidies. More than half of US states have adopted clean and/or renewable portfolio standards which require electric utilities to source some percentage of their electricity from renewable sources, though ambition and quality of these standards vary considerably. 14 states, Puerto Rico, and the District of Columbia, have adopted commitments to reach 100% clean electricity sometime between 2035 and 2050. A recently passed policy in Illinois set an ambitious timeline for reaching 100% carbon-free energy by coupling climate regulations with significant public investments in renewables and high-road labor and equity standards for projects supported by the policy.¹⁸

The **Clean Electricity Payment Program**, included in the Biden Administration's **Build Back Better** proposal resembled these renewable portfolio standards, but would have paired fines for utilities that fail to meet targets with grant payments to those that over-perform— an example of how green industrial strategy—aligned policies can incorporate both carrots and sticks in their design rather than implementing each separately. Ultimately, this policy was largely eliminated from the Inflation Reduction Act, but it is an idea worth pursuing at the state level to achieve a range of joined labor and environmental objectives.

Some states are considering approaches to decarbonizing the electricity sector that promote new models of **public ownership**. In **New York**, the **Build Public Renewables Act** would expand the service of the state's public electricity provider, the New York Power Authority, from schools, public buildings, and municipal utilities to a larger swath of New Yorkers.¹⁹ The bill expanded the public utility's ability to build renewable energy and required the authority to provide 100% renewable energy. In **Maine**, there is an ongoing campaign to buy out the distribution

18. David Roberts, "Illinois' brilliant new climate, jobs, and justice bill," Volt (podcast), September 22, 2021, <https://www.volts.wtf/p/illinois-brilliant-new-climate-jobs#details>.

19. Zack Fink, "Lawmakers hope public hearings will put the Build Public Renewables Act on Assembly's agenda," *Spectrum News*, June 9, 2022, <https://spectrumlocalnews.com/nys/central-ny/politics/2022/06/09/supporters-hopeful-build-public-renewables-act-will-rebound>.

utilities and create a state-wide “consumer owned utility”—the Pine Tree Power Authority—as the utilities delay interconnection times for renewables and have plummeting reliability with increased extreme weather.²⁰

At the federal level, green industrial policies impacting the electricity sector have mostly taken the form of public investments in research, development and deployment of low-carbon technologies, environmental procurement standards and tax credits for the construction and use of renewable technologies. This section focuses on **tax credits**. For more on investments in R&D, see the section on manufacturing, below. For more on procurement standards, see the section on heavy industry. Tax credits for renewable technologies are broken down into two categories, one for investments in new electricity generation capacity, the ITC or investment tax credit, governed by section 48 of the US tax code,²¹ and one for the production or generation of electricity using renewable technologies once they are installed, the PTC, or production tax credit, governed by section 45.²² A wide array of technologies are eligible for the ITC, ranging from solar and wind to fuel cells and waste energy recovery, as well energy storage paired with renewable generation technologies, but also include unproven and potentially dangerous technologies like carbon capture and storage. The PTC was only available for renewable technologies such as wind, solar, and hydro, as well as municipal solid waste energy generation facilities but has been expanded in the Inflation Reduction Act. States have adopted renewable and clean energy tax credits, too. Maryland recently became the first state to adopt a tax credit specifically for energy storage systems without regard to the source of power used to charge the system.²³

One continuing tension in debates around the most equitable green industrial strategy approach to adopt in the electricity sector revolves around whether to disperse public investments or centralize them through utilities. Proponents of **energy democracy** argue that policies promoting rooftop and community-scale solar in low-income communities offer opportunities to build wealth and enable community control of energy systems. These social justice advocates sometimes align with more traditional environmental organizations, which tend to support decentralized generation policies even when

those policies favor higher-income households. **Labor unions** representing energy sector workers tend to argue that public monies should be channeled through utilities because utility-scale renewables offer lower-cost electricity and tend to have higher labor standards than those seen in the residential and small-scale renewable energy and energy efficiency industries—industries that have been plagued by low wages, job insecurity, and lack of advancement opportunities. In California, these tensions have come to a head most recently in debates surrounding efforts to reform net energy metering laws, and will need to be considered in any state where green industrial policies are predicated on coalition support from each of these constituencies.

TRANSPORTATION

With emissions in the electricity sector declining, transportation now represents the largest source of greenhouse gas emissions in the US. Yet reducing emissions in the transportation sector has proven much harder than electricity. Decarbonizing the transportation sector requires policy interventions aimed at shrinking the enormous size of our standard cars, reducing private car use and electrifying the transportation of people and goods. Electrifying private vehicles and trucks, expanding and electrifying public transportation and finding zero-carbon and carbon-neutral ways to power airplanes, container ships, and ports.

Policies aimed at expanding the use of **private electric vehicles** have received the most attention in debates around how to decarbonize transportation. The federal government adopted tax credits for electric vehicles in 2010 that offered consumers up to \$7,500 per vehicle, depending on the vehicle’s battery capacity and other design features. These tax credits were capped at 200,000 per manufacturer, and so popular makes and models like Teslas and the Chevrolet Bolt, for example, lost eligibility. The Inflation Reduction Act expands EV tax credits and makes them available at the point of sale rather than through a rebate, albeit in a haphazard and likely maladaptive way—on the plus side, there are domestic content and manufacturing incentives, but the rebates are more generous for more expensive, heavier vehicles that have huge social and environmental externalities, operating as a defacto regressive subsidy that disproportionately favors wealthy families.²⁴

20. “Our Power” Our Power Maine, accessed April 15th, 2023, <https://ourpowermaine.org/>.

21. “26 U.S. Code § 48 - Energy credit,” Cornell Law School, accessed April 15th, 2023, <https://www.law.cornell.edu/uscode/text/26/48>.

22. “26 U.S. Code § 45 - Electricity produced from certain renewable resources, etc.,” Cornell Law School, accessed April 15th, 2023, <https://www.law.cornell.edu/uscode/text/26/45>.

23. “Solar battery incentives and rebates,” energysage, updated April 5th, 2023, <https://www.energysage.com/energy-storage/benefits-of-storage/energy-storage-incentives/>.

24. Thea Riofrancos, Alissa Kendall, Kristi K. Dayemo, Matthew Haugen, Kira McDonald, Batul Hassan, Margaret Slattery, and Xan Lillehei, “Achieving Zero Emissions with More Mobility and Less Mining,” 2023, Climate and Community Project, <http://www.climateandcommunity.org/more-mobility-less-mining>.



47 states provide further tax incentives either for the purchase of electric vehicles or to subsidize the cost of charging stations through direct state appropriations or through utility-managed, public utility commissions-approved schemes.²⁵ California made headlines when the state considered making its tax credits available only to companies providing a “fair and responsible workplace” after Tesla was found guilty of illegal union busting tactics.²⁶ Federally, the Build Back Better proposal also included additional tax credits for EVs produced by union auto-makers—a tactic that merits consideration in state-level industrial policy not just for EVs, but for an array of green goods. Federal regulations such as CAFE (Corporate Average Fuel Economy) standards also shape automaker incentives when it comes to producing fuel efficient cars. The Clean Air Act Amendments of 1990 provided an avenue for states to use their market power to drive auto manufacturing toward fuel efficient and zero-emission vehicles by adopting California’s Clean Car standards. 16 states have now done so.

25. Austen Igleheart, “State Policies Promoting Hybrid and Electric Vehicles,” National Conference of State Legislatures, April 26th, 2022, <https://www.ncsl.org/energy/state-policies-promoting-hybrid-and-electric-vehicles>.

26. “California May Nix Tesla Tax Rebate as Part Of Proposed Labor Rule,” CBS, June 11, 2018, <https://www.cbsnews.com/sanfrancisco/news/california-may-nix-tesla-tax-rebate-as-part-of-proposed-labor-rule/>.

27. “Electric School Bus Initiative,” World Resources Institute, accessed April 15th, 2023, <https://www.wri.org/initiatives/electric-school-bus-initiative>.

Expanding and electrifying public transit and other government vehicle fleets like school buses and mail delivery vehicles provide governments tremendous opportunities to prioritize equity, high-road labor practices, and transit accessibility.²⁷ Aided by new funding for school bus electrification included in the Bipartisan Infrastructure Law, states like Connecticut have also taken steps to ensure that school bus electrification provides targeted benefits for low-income communities and communities of color, helping improve air quality in some of the state’s most polluted neighborhoods.²⁸

Jobs to Move America (JMA) is an advocacy organization that has been at the forefront of efforts to ensure that public dollars are spent wisely on expanding and electrifying public transportation, while providing high-quality career opportunities to workers of color and other historically marginalized communities.²⁹ Their US Employment Plan provides model legislation for other social movement organizations and local transit agencies

28. “Bipartisan Infrastructure Bill Clean School Bus Program,” Connecticut Department of Energy & Environmental Protection, accessed April 15th, 2023, <https://portal.ct.gov/DEEP/Business-and-Financial-Assistance/Grants-Financial-Assistance/Bipartisan-Infrastructure-Bill-Clean-School-Bus-Program>.

29. “Jobs to Move America,” Jobs to Move America, accessed April 15th, 2023, <https://jobstomoveamerica.org/>.

interested in using public purchasing power aimed at decarbonizing transit to ensure those public investments support the development of a high-road electric vehicle manufacturing industry.³⁰ Adopted after a successful campaign by labor and racial justice organizations, Los Angeles Metro's Manufacturing Careers Policy, for example, incorporates elements of JMA's US Employment Plan to leverage the transit agency's purchasing power to require manufacturers of public transit vehicles to abide by high-road labor standards and ensure that historically marginalized workers have access to good jobs.³¹

To help decarbonize the **transportation of goods**, six states have adopted **advanced truck rules** that require freight trucks to meet emissions standards. One challenge that emerges when adopting these rules is that many trailer trucks are owned and operated by independent contractors, often working-class men of color. When designing initiatives to decarbonize trucking, it is critical to ensure that the large corporations benefiting from the labor of these individuals pay the costs of transitioning to an electric fleet. Pushing costs to drivers already struggling to make ends meet will also raise the barriers to entry in an industry experiencing acute understaffing.

BUILDINGS

Decarbonizing buildings involves two primary tasks: 1) improving energy efficiency and 2) electrifying heating and appliances currently operated with gas or other fossil fuels like home heating oil. Each involves its own set of regulatory needs and green industrial policies.

The most prominent approaches to building electrification are appliance efficiency standards and public investment programs aimed at increasing the adoption of more sustainable appliances. Governments can support building electrification in at least three ways: 1) establishing appliance efficiency standards or electric appliance

mandates, 2) providing tax credits to customers that purchase and/or install electric appliances, and 3) directly providing electric appliances and installation services. Appliance efficiency standards are relatively widespread across the states and for a wide variety of appliances, ranging from air conditioners to hot food holders.³² These standards can also be ratcheted up over time, as New Jersey did recently.³³

One technology that has received significant attention recently are **electric heat pumps**. These technologies can heat and cool residential and commercial buildings using a single process that moves hot and cool air to their desired locations, either within or outside of the building. A broad patchwork of federal, state, and utility incentive programs exist to support the deployment of electric heat pumps.³⁴ The federal investment tax credit offers 22% off the system price in 2023. A number of states offer additional incentives either providing tax rebates and credits, or reducing the price of installation via programs administered by utilities and independent organizations. These programs are rapidly growing. Their total value added up to nearly \$110 billion in 2020, a 70% increase compared with 2019.³⁵

While tax credits and appliance efficiency standards are the more common approaches, some jurisdictions have also directly provided electrification services. New York recently approved a \$25 billion program aimed at electrifying buildings across the state. The program includes dedicated funds to electrify low to moderate-income households. This public-investment-driven approach allows policymakers to promote more equitable decarbonization. Governments investing in heat pumps can target investments to low-income residents, public and affordable housing, and/or environmental justice communities. The public housing and power authorities in New York City are driving electrification technology for apartments by facilitating the design and deployment of heat pump window units.³⁶

30. "U.S. Employment Plan," Jobs to Move America, posted April 5th, 2020, <https://jobstomoveamerica.org/resource/u-s-employment-plan-2/>.

31. Harold Meyerson, "Building Our New Electric Fleet," *The American Prospect*, May 31, 2022, <https://prospect.org/blogs-and-newsletters/tap/building-our-new-electric-fleet/>.

32. "States," Appliance Standards Awareness Project, accessed April 15th, 2023, <https://appliance-standards.org/states>.

33. "Organizations Celebrate Passage of Bill to Update Appliance Standards that will save Consumers Money and Reduce Pollution," Insider NJ, January 10, 2022, <https://www.insidernj.com/press-release/organizations-celebrate-passage-bill-update-appliance-standards-will-save-consumers-money-reduce-pollution/>.

34. "The Guide to Federal, State, and Utility Incentives for Geothermal Heat Pumps," Dandelion Energy, accessed April 15th, 2023, <https://dandelionenergy.com/geothermal-state-federal-tax-incentives>.

35. Steve Nadel, "Programs to Electrify Space Heating in Homes and Buildings," American Council for an Energy-Efficient Economy, June 2020, https://www.aceee.org/sites/default/files/pdfs/programs_to_electrify_space_heating_brief_final_6-23-20.pdf.

36. "NYPA Launches Challenge For Innovative Heat Pump," American Public Power Association, December 21st, 2021, <https://www.publicpower.org/periodical/article/ny-pa-launches-challenge-innovative-heat-pump>.

In states where tax credits for green building technologies either already exist or are more politically feasible than direct provision of electricity through public ownership, advocates could also push policymakers to attach equity and labor standards to tax credits for energy efficient and fully electric appliances, as California has.

Energy efficiency is another area where policymakers at the state and local levels have made progress. Federal policies such as the **weatherization** program included in the American Recovery and Reinvestment Act of 2008 increased the energy efficiency of nearly 800,000 homes across the country. While this program helped to grow the market for energy efficiency products and services, labor unions were often unimpressed by the impact on jobs, arguing that the industry needs higher job quality standards more than efforts to create new jobs. Nevertheless, funding for energy efficiency programs continues to grow, with funds being channeled primarily through electric utilities and not-for-profit organizations.³⁷ Pennsylvania’s Whole Homes Repair Act is an important state policy in this field.³⁸ Passed in 2022, it appropriates \$125 million for retrofits, worker training, and county-level administration to make houses code compliant such that they can access further assistance for weatherization and electrification.

GREEN GOODS MANUFACTURING

Unlike some sector-based analyses of climate policies and green industrial policies, here we divide manufacturing and industry into distinct sections. Manufacturing deals with *what kinds* of goods are produced. For example, do vehicles come with internal combustion engines, or batteries and electric motors? Heavy industry, discussed below, looks at *how* goods are produced, specifically the embedded emissions they contain.

The United States has a relatively long history of industrial policies aimed at promoting the domestic manufacturing of green goods. ARPA-E grant programs, for example, provided grants to researchers in the United States working on developing cutting edge energy technologies. Along with tax credits, this R&D investment has been the primary path of green industrial policy in the United States over the last several decades.³⁹ States could

and should make these kinds of R&D investments where possible, for example through newly established green banks or dedicated green technology incubators in a way tailored to their historic or contemporary manufacturing strengths by partnering with local universities—especially HBCUs and regional universities focus on underserved communities to foreground the equity dimensions that industrial policy can bring to the table.

Tax credits can also incentivize production in the United States, either by being directed to producers, rather than consumers, or making consumer tax credits eligible only for products produced domestically. The Inflation Reduction Act includes \$12 billion in new incentives, plus \$20 billion in loans, for the creation and conversion of manufacturing facilities to produce zero-emissions cars.

Lastly, focusing on the manufacturing of green goods also serves to emphasize how different segments of, for example, the “renewable energy industry” can possess distinct, sometimes conflicting interests. President Biden’s recent use of the Defense Production Act (DPA) to boost the output of solar panels sought to balance the interests of these two industry segments. The executive order included two major provisions. Similarly to the administration’s earlier order aimed at ramping up the mining and processing of lithium and other electric vehicle battery components, the White House’s communications placed the administration’s use of the DPA to direct companies to ramp up production of solar PV components at the foreground.⁴⁰

Energy reporting, meanwhile, emphasized the EO’s freeze on possible retroactive tariffs on PV panels imported from Cambodia, Vietnam, Thailand, and Malaysia, which are currently under investigation by the DOC for possible violations of rules aimed at preventing the dumping of goods produced in China.⁴¹ This trade policy aims to increase supplies of panels for installers. Manufacturers, however, worried that this move would undermine the growth of solar panel production in the United States. While we do not delve into the world of trade in this primer, it is a critical component for articulating a coherent green industrial strategy, particularly as the consent manufacturing apparatus is ratcheting up hostility against China—a counterproductive

37. Mike Prokosch, “What Happened to All the Weatherization Jobs?,” *LaborNotes*, June 19, 2012, <https://labornotes.org/2012/06/what-happened-all-weatherization-jobs>.

38. “Whole Homes Repair,” Senator Nikil Saval, accessed April 15th, 2023, <https://www.pasenatorsaval.com/wholehomerepairs/>.

39. “Search our Programs,” ARPA-E, accessed April 15th, 2023, <https://arpa-e.energy.gov/technologies/programs>.

40. Ethan Howland, “Biden Invokes Defense Production Act to Bolster Domestic Battery Manufacturing for EVs, Energy Storage,” *Utility Dive*, April 1, 2022, <https://www.utilitydive.com/news/biden-defense-production-act-domestic-battery-manufacturing/621428/>.

41. Tim Sylvia, “BREAKING: Biden Admin to pause new solar tariffs for two years,” *pv magazine*, June 6, 2022, <https://pv-magazine-usa.com/2022/06/06/breaking-biden-admin-set-to-pause-new-solar-tariffs-for-two-years/>.

development for a number of reasons, not the least of which is the need to dramatically grow manufacturing capacity for the inputs to a just energy transition in the US and around the world regardless of its location.

HEAVY INDUSTRY

Green industrial policies aimed at decarbonizing heavy industry focus on reducing the “embedded” or “embodied emissions” that occur during the production of a variety of goods.⁴² These embedded emissions occur in the production of chemicals, fuels and other heavy products, such as construction materials. But they also occur in what might be considered part of the agricultural sector, such as during the packaging of staple food goods such as canned vegetables, and even the fermentation and bottling of wines.

Heavy industry has been challenging to decarbonize. Doing so involves a series of distinct product-specific tasks. These tasks include reducing the use of energy, preventing emissions leakage at, for example, abandoned oil wells, and replacing combustion-based machinery with electric alternatives. In many instances, zero-carbon alternatives do not exist for industrial processes, making it necessary to find ways to switch high-carbon fuels with lower-carbon ones as a temporary stopgap while researchers develop feasible alternatives.

One prominent industrial policy effort to decarbonize heavy industry aims to “**Buy Clean**,” and leverage the purchasing power of public procurement to incentivize construction materials manufacturers to decarbonize their operations. These programs leverage the incentive of access to **public procurement** contracts to implement disclosure requirements and emissions standards. California was the first state to adopt a Buy Clean program, followed by Colorado, with seven states currently considering policies aimed at reducing the embedded emissions of construction materials purchased by public entities. Municipalities such as Austin, TX, Portland, OR, and King County, WA have also adopted similar policies.⁴³

Though Buy Clean policies are technology-agnostic, they can nevertheless be considered green industrial policies. By creating a market for products

produced using new techniques, they have the potential to grow the market share of manufacturers that meet high environmental standards, positioning them as first movers and to become market leaders as their industry decarbonizes globally. Many of the manufacturers that meet these standards are based within the United States. The Buy Clean approach also helps build coalition with labor unions because most of those environmentally high-performing companies also have high road labor practices, and some even have union representation.

LAND MANAGEMENT

Like heavy industry, the land management sector encompasses a broad, diverse range of industries and activities ranging from wildfire prevention to recreation and agriculture. In agriculture, cities, states and other institutions such as universities have used their purchasing power to support the growth of food producers that use sustainable practices and respect the rights of workers. Farmers’ markets and the variety of policies in place to support them can also be considered a green industrial policy, in that they support the growth of local, often sustainably produced food products. While agriculture represents a key area for climate policymaking, industrial policies aimed at growing sustainable agriculture in the industry have yet to expand far beyond these smaller-scale initiatives though this is poised to change as negotiations around the new farm bill heat up.

The management of public lands similarly holds potential for new approaches to developing green industries. As outlined in CCP’s recent report, *High Roads to Resilience*, the active forest management necessary to reduce the destructiveness of climate-change-induced wildfires presents opportunities to develop new industries that process wood products.⁴⁴ With increased investments in the development of wood processing infrastructure, policy support for local utilization of non-timber biomass, high-road labor requirements and meaningful consultation with Indigenous communities, these industries hold the potential to build more resilient and equitable economies in rural communities.

42. “1 – Embodied Carbon 101,” Carbon Leadership Forum, accessed April 15th, 2023, <https://carbonleadershipforum.org/embodied-carbon-101/>.

43. “2 – What is a Buy Clean Policy?,” Carbon Leadership Forum, accessed April 15th, 2023, <https://carbonleadershipforum.org/embodied-carbon-101/>.

44. Sara Nelson, Patrick Bigger, Micah Elias, and Andrew Schuldt, “High Roads to Resilience,” 2022, Climate and Community Project, <http://www.climateandcommunity.org/highroads-to-resilience>.

This introduction to green industrial strategy has sought to lay out some of the key ideas of articulating a joined-up approach to just decarbonization and adaptation to a warming world. In contrast to market-based environmental policy, green industrial policies take a more direct approach to guiding markets; thus far, federal policy has focused far more on subsidizing desirable industries than regulating undesirable ones, but recent policy advancements like some key provisions of the Inflation Reduction Act signal a greater willingness to intervene in critical economic sectors than at any time in recent memory. The second half of this primer described a number of existing and proposed components of green industrial strategies across sectors and at different levels of government. It should be noted that while state regulation and investment is important, the US federal government can make investments orders of magnitude larger than the states, and so will continue to have a central role in defining the future of green industrial strategy—for better or for worse. For more detailed research and policy analysis on a variety of sectors and issues relevant to designing green industrial strategy, visit climateandcommunity.org.

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