

Kaleidoscopic Federalism in U.S. Climate Policy

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1. Introduction

This chapter focuses on state-level climate policies in the United States in the context of its federal system. The empirical focus is on policies that have been adopted by many states and that have been most effective in reducing greenhouse gas (GHG) emissions, which include target setting, emissions trading, and sectoral policies on renewable energy, motor vehicles, appliances, and power plants (Karapin 2016; Karapin/Vogel 2024: ch. 1). It addresses five questions: First, what are the most important policies that state governments have adopted over the last few decades? Second, how have those efforts tied in with federal policies in the same areas? In other words, what kind of federalism does the U.S. have when it comes to climate policy? Third, in what ways have California and the federal government recently accelerated the adoption of climate policies? Fourth, in what ways have state and federal governments affected each other's climate policies? Fifth, what is the overall impact of U.S.-style federalism on climate policy?

2. Background: Climate Policy Federalism in the United States

The U.S. federal system has historically given state governments a large role in energy and air pollution policies, which in recent decades has translated into a large state government role in climate change mitigation policies (Byrne et al. 2007). State policies that tend to reduce GHG emissions – *de facto* climate policies – date back to the 1970s, before global warming emerged on the policy agenda in the late 1980s.

This has had two major effects on the policy landscape. One is that state governments established *de facto* sectoral climate policies in a number of areas (especially vehicles, appliances, and electricity) before or at the same time that they began to consider cross-cutting measures such as GHG targets and emissions trading programs, and these sectoral policies continue to dominate state as well as federal climate change mitigation efforts. The second effect is that policy goals other than GHG reduction – such as ensuring the reliability of energy supply, reducing local air pollution, avoiding the economic costs and environmental effects of power plant construction, and creating jobs – have continued to be important political motivations for state and federal policy adoption, even as mitigating climate change has emerged as an important goal.

Several other features of U.S. federalism are worth noting. First, the federal Constitution provides for the supremacy of national laws over state laws, while historically and constitutionally state governments have authority where the federal government does not act. Given the failure of Congress to act in many climate policy areas, this has led to a patchwork in which states have large roles in many sectors, but those roles are sometimes preempted by federal law or regulation. Second, as climate and other environmental poli-

cies have become strongly polarized between the political parties since the 1980s (Dunlap et al. 2016), partisan differences have overshadowed state interests in Congress. Renewable energy tax credits, which are economically important to Republican states even more than to Democratic ones, have been supported only reluctantly by congressional Republicans, who also recently opposed the electric vehicle and renewable energy tax credits of the *Inflation Reduction Act*, even though they would disproportionately benefit Republican-governed states.

Third, the *Clean Air Act* has given the state of California a “super-regulator” role (Carlson 2009), allowing it to lead a coalition of states in adopting vehicle air pollution policies more stringent than those of the federal government. This creates an important channel for the interaction and coordination of state and federal motor vehicle policies (GHG emission standards, electric vehicle subsidies). The road vehicle sector is a crucial one, since it is responsible for 27 % of U.S. net GHG emissions (author’s calculation from data in USEPA 2023: 2-10, 2-38, 2-39). California has also been a leader among the states in many other sectoral climate policies, including appliance standards and renewable energy. The state’s key role in U.S. climate policy is buttressed by its liberal citizenry, large markets, and its academic and economic leadership in “climate technology” areas (Mazmanian et al. 2020; Vogel 2018).

Although state governments have led the way in many areas of U.S. climate policy, the federal government has expanded its role, especially since 2009. This had led authors to see a variety of types of climate policy federalism, such as *compensatory federalism* (Derthick 2010), *iterative federalism* (Carlson 2009), *contested federalism* (Rabe 2011), or *cooperative federalism* (Barichella 2023). However, these views are only partial. Since the scope and nature of federal activity varies across policy areas and over time, and federal-state relations do so as well, I argue that a more accurate concept for the entire system is “kaleidoscopic federalism” (Birkland et al. 2023: 20; MacDonald 2005: ch. 7; Benton 2020).

Kaleidoscopic federalism involves “ad hoc solutions tailored to fit (...) particular circumstances and claims” (Birkland et al. 2023: 37). This results in a mixture of different kinds of state-federal relationships in different policy areas. More specifically, this chapter posits that the U.S. system includes at least eight different types of federalism, understood as metaphors for intergovernmental relationships, arranged on two dimensions: the degree of overlap between state and federal authority; and the degree of conflict over policy goals between the leading climate-policy states and the federal government (see Tab. 1). Two of these are subtypes of dual federalism. In *compensatory federalism*, states act because federal policy is weak or absent (Derthick 2010: 65ff.; Jordaan 2019: 222), while *unilateral federal policies* are those adopted and carried out without state involvement, including preemption of state policies in many cases (Posner 2007).

Tab 1: Types of state-federal intergovernmental relations in U.S. climate change policy

Degree of conflict Authority	High conflict over climate policy goals	Low conflict over climate policy goals
<i>Separate:</i> Dual federalism	Compensatory	Unilateral federal policies
<i>Overlapping:</i> Shared governance	Unfriendly competitive Coercive	Cooperative Friendly competitive Complementary Iterative

Source: Own compilation.

There are also four kinds of federalism involving shared governance and low conflict over climate policy goals. In *cooperative federalism*, federal and state governments have similar goals, and federal policies are implemented by the states (Birkland et al. 2023: 29; Jordaan et al. 2019: 222).¹ In *friendly competition*, both levels of government have similar goals and use similar, overlapping instruments (Watts 2006: 211f.), while in *complementary federalism*, federal and state governments use different policy instruments in pursuit of similar goals (Hale 2004). Either of those can become *iterative federalism* if positive feedback (mutual reinforcement) develops between state and federal policies (Carlson 2009; Fisher 2013). Finally, if shared governance is conflictual, it can result in *unfriendly competition*, in which the federal government resists state efforts to adopt regulations that are more ambitious than federal rules (Watts 2006: 211f.) or *coercive federalism*, in which states resist implementation of policies that the federal government attempts to impose through its legal and financial levers (Birkland et al. 2023: 30).

The next section describes the main climate policy areas in which state governments have been active, while using this typology to characterize their relationship to federal policy-making in the same areas. The fourth section briefly describes the recent acceleration of policy-making by California and the federal government. The last two sections analyze the interactions between state and federal policies and assess the overall impact of U.S. federalism on climate policy.

3. State Climate Policies and Kaleidoscopic Federalism

What are the most important climate policies that state governments have adopted over the last few decades? How do those efforts relate to federal policies in the same areas?

¹ This use of *cooperative federalism* is narrower than the concept of Daniel Elazar and others, who emphasize a variety of cooperative state-national relations in contrast to conflictual relations and to dual federalism; see Zimmerman 2001: 18f.

3.1 *Targets and Action Plans*

While most state climate policies are sectoral, 24 states have economywide GHG reduction targets and 33 states have climate action plans (data from Center for Climate and Energy Solutions 2023a/b). Most states began to adopt these policies during the George W. Bush administration (2001–09), but many have updated the targets more recently, and 16 states are now aiming at carbon neutrality by 2050 (data from California-China Climate Institute 2023). However, only 10 states have statutory targets that are legally binding on emitters or state government agencies: California since 2006 and the other nine states only since 2019 (EDF 2023). Target setting has alternated between *friendly competitive* and *compensatory federalism*, depending on the presidential administration. During Democratic administrations, both leading states and the federal government have had GHG targets, the latter expressed in international agreements: Bill Clinton’s 7 % reduction from 1990 to 2008–12 (Kyoto), Barack Obama’s 26 % cut over the 2005–25 period (Paris), and Joe Biden’s 50 % reduction over the 2005–30 period (Paris). This has been *friendly competition*, since the state and federal targets have been largely in accord, though not legally or mathematically coordinated with each other. Sometimes the federal targets have been more ambitious, and sometimes the state targets have been.

By contrast, during Republican administrations, which rejected the non-binding federal targets adopted by Clinton and Obama, the pattern has been *compensatory federalism*, a form of dual federalism, since state targets have compensated for federal inaction. In the late 1990s, when the Senate rejected the Kyoto Protocol and its targets in principle, New Jersey responded with its own pledge, and many more states adopted targets after the Bush administration rejected Kyoto and retreated from climate policy in 2001. States accelerated their targets again during the Donald Trump administration’s vigorous efforts at national climate policy retrenchment, when 12 states adopted stronger targets (data from Center for Climate and Energy Solutions 2023a). By contrast, climate action plans have always been compensatory, since even in Democratic administrations, the federal government has so far lacked an overall climate action plan that details how its targets can be achieved.

3.2 *Emissions Trading*

Although carbon taxation has not been adopted by any state, 13 states have emissions trading systems. Eleven northeastern states participate in an emissions trading program limited to the electricity sector, the *Regional Greenhouse Gas Initiative* (RGGI), which was created in 2005. California and Washington state operate economywide systems; the former’s was implemented in 2013 on the basis of the 2006 *Global Warming Solutions Act* and the latter’s went into effect in 2022. The price signals from these systems were quite weak until after 2021, averaging about \$2–8 per ton CO₂-equivalent in the northeastern states and \$10–15 per ton in California. But prices have recently (as of early 2024) risen to about \$15 and \$40 per ton, respectively, due in part to more ambitious GHG target and cap setting by these states. RGGI’s cap is now declining about 3 %/year, and California’s about 4 %/year, with the reductions to continue through 2030. RGGI and California

now auction most allowances, with the revenue used for a variety of politically popular GHG reduction programs.

Emissions trading has followed a completely *compensatory* pattern. The creation of RGGI and legislative authorization for California's system were promoted by Republican governors George Pataki and Arnold Schwarzenegger explicitly to compensate for President Bush's climate policy retreat and to encourage the federal government to follow their lead. However, the *Waxman-Markey bill*, which had a cap-and-trade program as its centerpiece, failed in the Senate after narrowly passing in the House in 2009, and carbon pricing has been off the federal policy agenda since then. Even though the Biden administration pressed for ambitious climate policies in every other area, it was silent about emissions trading or other forms of carbon pricing. The state compensatory pattern recurred during the Trump administration, when RGGI adopted a steeper rate of decline for its cap, California did the same and extended its program through 2030, and Washington, Oregon, New Jersey, Virginia, and Pennsylvania created or joined emissions trading programs, though three of those efforts have been delayed by litigation.

3.3 *Renewable Energy*

State governments have adopted a wide range of policies to support the development of renewable energy (Menz/Vachon 2006; Karapin 2020). By 2023, 29 states accounting for 58 % of electricity sales had introduced renewable portfolio standards, which require electricity utilities to sell certain percentages of renewable-source electricity or purchase renewable energy certificates from other geographic areas to meet the shortfall (Barbose 2023: 8, 31). More than half of these states have targets for 2030 or beyond, and 18 have carveouts or credit multipliers that give utilities extra incentives to deploy solar technologies. In addition, forty-four states had adopted net metering rules by 2010, although as solar PV has expanded while production costs have fallen, resistance from utilities has led to reductions in the generosity of the rules in many states (APCO 2019; Stokes 2020; Apadula et al. 2023).

The state policies supporting renewable energy have complemented the main federal policies affecting this sector, which are research and development spending, a production tax credit for wind energy (created in 1992) and an investment tax credit for solar energy (increased in 2005). Hence this policy area follows the pattern of *complementary federalism*. Both levels of government are active in supporting renewable energy development, their efforts are generally not in conflict, and they use different policy instruments, although there is little or no policy coordination. Complementary federalism in the renewable energy area has also produced an indirect kind of positive feedback, or *iterative federalism*. Since federal and state policies are both needed by the wind and solar industries, federal and state policy adoptions have influenced each other indirectly by enhancing the economic viability of those industries, which in turn lobby for policies at both levels of government and make increasingly credible claims about providing co-benefits such as job creation and air pollution reduction.

Additionally, utility regulation has been an area of *cooperative federalism*², in which states implement federal policies. Key federal laws in 1978 (PURPA) and 1992 (Energy Policy Act) and ensuing regulations in various ways required, permitted, and encouraged state reforms that opened electricity markets to independent power producers and required utilities to engage in least-cost planning (Hirsh 1999). The latter makes clear that it is often economically advantageous for utilities to build new wind and solar installations or purchase wind and solar electricity from independent power producers instead of building large fossil-fuel or nuclear power plants.

3.4 Motor Vehicles

California has led a coalition of state governments in reducing GHG emissions from motor vehicles through two main policy instruments. In 2002, the legislature passed the *Pavley bill*, which directed the *California Air Resources Board* (CARB) to develop GHG standards for light-duty vehicles (passenger cars and “light trucks,” which include SUVs). In 2004 the agency adopted rules requiring a 24–37 % reduction in vehicle GHG emissions over the 2009–16 period. Seventeen other states announced intentions to follow these rules, representing 45 % of the national car market (Karapin 2016: 41). However, the federal *Environmental Protection Agency* (EPA) during the Bush administration rejected CARB’s request for a waiver as required under the federal Clean Air Act, so the Pavley rules did not take effect before they were preempted by national standards adopted by the EPA during the Obama administration in 2010. Although California voluntarily allowed its program to be preempted by those federal rules, it reserved the right to adopt stricter rules than the federal government. When the Trump administration in 2018 sought to freeze GHG standards for vehicles, California again created its own standards, calling for a 3.7 % decline in GHG emissions per mile. It was joined by 13 other states, and despite legal opposition by the Trump administration, about half of the major carmakers announced they would comply with the California program. When the Biden administration announced stricter standards in 2021, state rules were again preempted but California again retained the right to adopt stricter standards (Dorsey 2022).

Additionally, beginning in 1990, California has had sales quotas for electric and hybrid vehicles. In 2012, its *Zero-emission Vehicle Program* required 16 % of vehicles sold in the state to be all-electric by 2025, a rule followed by 15 other states (McConnell et al. 2019; CARB 2022). In 2022, CARB went further, requiring 35 % of vehicle sales to be all-electric by 2026, 68 % by 2030, and 100 % by 2035 (Davenport et al. 2022). These rules require waivers from the EPA, and President Trump rescinded California’s waivers for GHG standards and the Zero-emission Vehicle Program. However, President Biden restored them, an action which 17 Republican-governed states sued to overturn; they lost

2 Although there is little state implementation of federal policy in the areas treated in this chapter, states do implement *de facto* federal climate policies in areas where GHG impacts are relatively small or are difficult to assess, such as federal funding of state energy efficiency programs and federal regulation of utilities and electricity grids. States are also involved in implementing the Biden administration’s methane regulations for landfills and for the oil industry, important federal policies in areas that have seen relatively little independent action by states.

in a federal appeals court in April 2024, but the case may go to the Supreme Court. Sixteen states also have tax credits for consumer purchases of electric vehicles (data from Sirull/McDevitt 2024).

GHG standards for vehicles have alternated between an *unfriendly* form of *competitive federalism* during the Bush and Trump administrations and a *unilateral federal policy* during the Obama and Biden administrations. In the former, California and its allied states sought tougher rules than the federal government and policy-making authority was highly contested, as the federal EPA refused to grant the necessary waivers and litigation ensued. While the federal government has had the sole authority to set fuel economy standards under a 1975 law, California claimed its rules were not preempted since they regulated GHG standards, even though in practice those would force carmakers to improve fuel economy as the main means of compliance. This conflict culminated in a key Supreme Court decision, *Massachusetts v. EPA* (2007), that effectively required the EPA to regulate GHG emissions and led to a program of federal GHG standards for light-duty vehicles. The Obama administration negotiated this program's rules with California as well as the carmakers, and extended it to medium- and heavy-duty trucks in 2011. However, it is likely that the *unfriendly competitive* pattern will arise again the next time a Republican is elected president and attempts to roll back federal GHG standards for vehicles.

By contrast, policy on electric vehicles was more stable and less conflictual until recently, in part reflecting bipartisan congressional support for this technology since the mid-2000s due to its perceived role in supporting U.S. manufacturing industry and associated jobs. The policy-making patterns have varied depending on the specific policy instrument.

Before Trump, the sales quotas followed a pattern of *compensatory federalism*, since the federal government did not adopt a quota and the EPA granted California waivers for its Zero-emission Vehicle Program. But the pattern has changed recently. The Trump administration's withdrawal of the EPA waiver created a period of *unfriendly competition*. The Biden administration restored the waiver and also began to involve the federal government in setting targets for electric vehicle sales. In 2021 it announced only an aspirational goal for electric vehicle purchases (40–50 % by 2030), but the EPA's GHG standards for the 2027–32 model years, announced in 2024, are projected to force carmakers to increase electric vehicles to 56 % of sales in 2032. While this is lower than California's recent targets, which at least 11 other states are planning to follow, this has now become an area of *friendly competition* between the states and federal government as of the time this was written (May 2024), which, again, is likely to turn back into *unfriendly competitive federalism* the next time a Republican becomes president.

By contrast, state and federal governments both offer tax credits to vehicle purchasers. The latter has offered them since 2005 and made them more generous and long-term in the 2022 Inflation Reduction Act, while 16 states now have these tax credits. The state and federal tax credits overlap and are additive for purchasers, and both support the electric vehicle industry, even though they are not coordinated with each other, so they are *complementary*. Finally, as in renewable energy, state and federal policies on electric

vehicles influence each other indirectly since both increase the economic viability of the electric vehicle industry, in a kind of *iterative federalism*.

3.5 *Appliance and Equipment Standards*

California, New York, and several other states began regulating the energy efficiency of appliances in the 1970s, largely to reduce the need to build new, expensive, environmentally harmful power plants to meet rising consumer demand for electricity. State standards led the appliance industry to seek a federal law in 1987, and since then federal standards for a growing number of products have preempted state rules (Aulisi et al. 2007). Currently there are federal rules for more than 60 products in residential and commercial applications, as well as a program of voluntary standards (Energy Star, created in 1992) to encourage even higher efficiency in the residential, commercial, and industrial sectors. However, preemption is only partial; federal law permits state governments to adopt standards for products that the federal Department of Energy does not regulate, and currently 18 states have such standards in place, including for such important products as computers and televisions (data from Appliance Standards Awareness Project 2024).

Separately, building codes are largely a state matter, with the federal government encouraging states to adopt the most recent model codes of the International Code Council or a domestic trade association (ASHRAE), and states vary greatly in the extent to which they have updated their codes to meet the latest standards (data from U.S. Department of Energy 2024).

Appliance standards began as *compensatory* policies, but due to congressional legislation and Department of Energy rule making became *unilateral federal* areas with no state role for most products. By contrast, for the products neglected by the federal government, the states' roles remain compensatory; they fill in for the federal government and potentially nudge the industry toward seeking federal rules for the additional products. Building codes remain largely an area of dual federalism, with a weak federal role in encouraging but not requiring states to update their codes (Rowan 2023: 36, 39).

3.6 *Power Plant CO₂ Emissions Standards*

Between 2004 and 2012, Washington, California, Oregon, and New York adopted rules for CO₂ emissions from new power plants, which usually set a standard around 1,000 pounds CO₂/MWh generated. This effectively permitted the construction of natural gas plants while banning new coal plants that lacked carbon capture and storage technology. These state standards were followed by federal EPA standards for new power plants in 2015, during the Obama administration, to be implemented by state governments and without preempting more ambitious state regulations. Trump's EPA proposed to overturn these rules in 2018, but did not complete the process before Biden took office.

A separate federal effort to set CO₂ rules for existing power plants, in the 2015 *Clean Power Plan*, was blocked in federal courts and then overturned by the Trump administration, before the Biden administration adopted a new set of rules in 2024. These would force existing coal plants to retire or add expensive carbon capture and storage technology

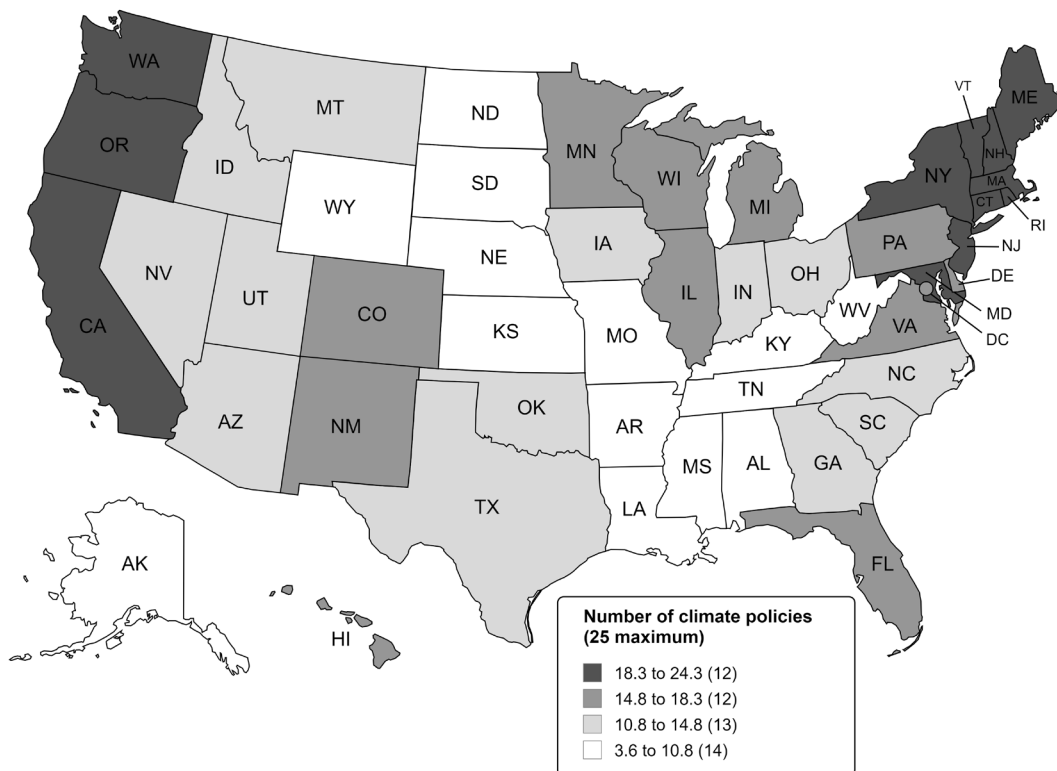
by 2032 in order to reduce GHG emissions by 90 %, and they add similar requirements for new natural gas plants; however, the rules face a strong court challenge by the Edison Electric Institute, a large trade association representing investor-owned utilities.

Like appliance standards, the state rules for new power plants were initially *compensatory* and then led to federal policies on new and existing plants to be implemented by the states in either *cooperative federalism* or *coercive federalism*, depending on the political leaning of the state.

3.7 Cross-state Diversity

Taking a step back from this description of policy areas, there is also an enormous amount of diversity in the climate policies adopted across the 50 states (see Fig. 1).³

Fig. 1: State Climate Policy Index, 2014



Source: Own analysis of Pew Research Center data.

Ambitious climate policies, both sectoral and economywide, have been largely limited to Democratic-governed states, leaving the 55 % of national GHG emissions that come from Republican-governed states much less affected by state policies (author's calculation from 2005–16 data in U.S. Energy Information Administration 2019: Tab. 2). Renewable energy is an important exception due to the location of strong wind and solar power technical potential in many Republican states, as well as the importance of co-benefits such as jobs and energy supply diversification, which are popular with Republican voters and

3 For details on the construction of the index depicted in this figure, see Karapin 2016: 31.

elected officials, in that policy area. However, even in this area, Democratic states have been much more active in updating their renewable portfolio standards in recent years (Barbose 2023: 10). The cross-state differences in climate policy are also strongly, negatively correlated with the amount of fossil-fuel production, as well as positively correlated with income, education, environmental organization strength, and local air pollution (Karapin 2016: ch. 5).

4. The Recent Acceleration of U.S. Climate Policy since 2017

4.1 California

California has been a leading state in environmental policy-making since the 1950s, in *de facto* sectoral climate policies since the 1970s, and in explicit GHG-reduction policies since the early 2000s (Mazmanian et al. 2008, 2020; Rabe 2009; Karapin 2016: chs. 6–7; Vogel 2018). Its climate policies stand out compared to other states in a number of ways. The policies are ambitious in many sectors, its GHG targets are legally binding on state agencies, and its targets and policies are frequently updated (Mazmanian 2020; Barnes et al. 2021). California's advantages in pursuing these policies include its liberal, pro-environmental citizenry, delegation of policy-making to an autonomous, respected, science-based regulatory agency (CARB), and an economy large enough to compel or incentivize major industries to comply with the state's regulations. With \$3.9 trillion in GDP, California would be the world's sixth largest economy in nominal terms were it a separate country.

More recently, partly spurred by the Trump administration's rollback of GHG regulations, California has accelerated its policies in many areas. During Jerry Brown's administration (2011–19) and under his successor, Gavin Newsom (since 2019), the state adopted many ambitious new targets. California aims to cut its gross GHG emissions by 85 % and achieve neutrality through carbon capture and removal by 2045, to make its electricity consumption 100 % carbon-free by that date, and to electrify all light-duty vehicles by 2035 (CARB 2022). California also extended its economywide cap-and-trade program to 2030 and adopted a steeper rate of decline in the cap. Allocation formulas for the auction revenue, which totals about \$1.7 billion per year, require at least 35 % to go to disadvantaged and low-income communities (CCI 2024).

California has also accelerated its vehicle policies. In 2020, the sales quota for all-electric vehicles was raised to 68 % by 2030. For electric trucks, CARB added sales quotas in 2020 (40–75 % of truck sales in the state to be zero-emission by 2034) and requirements for truck fleet owners that operate in California in 2023. The latter require an internal combustion engine phaseout by 2035–42 (depending on truck type), although the trucking industry has challenged these rules in federal court and implementation has been partially suspended while the EPA decides on CARB's waiver request.

For the electricity sector, California adopted a stronger renewable portfolio standard in 2018 (60 % by 2030), which was followed by the adoption of stronger standards by eight other states the next year. California also reformed its net metering rules to be less

generous to residential solar projects, incentivize battery storage and off-peak consumption, and distribute the costs more equitably among electricity customers (Matasci 2023; Sunrun 2024). The state has adopted ambitious goals for zero net energy building regulations, but implementation has been delayed. Since 2020, its Title 24 rules require new residential buildings to have rooftop solar, and accessory dwelling units were added to the requirement in 2023. Building code revisions in 2021–23 incentivize heat pumps in new residential construction and introduce requirements for reducing embodied carbon in building materials for large commercial projects (Delforge 2021).

4.2 *Federal Government*

The federal government lags behind California and other progressive state governments. It has no binding GHG targets, climate action plan for achieving GHG reductions, carbon pricing, or renewable portfolio standard. While the Obama administration used the EPA's authority under the *Massachusetts v. EPA* decision to adopt stronger policies on vehicles, power plants, appliances, landfill methane, and methane in the oil and gas industry, the Trump administration weakened or delayed all of them.

But during the 2020 presidential campaign, Biden ran on a detailed commitment to climate change policy – spurred by environmental activists and initiatives by progressive Democratic politicians such as Bernie Sanders and Alexandria Ocasia-Cortez – and acted on that commitment after taking office. Biden accelerated the federal government's GHG reduction target (Nationally Determined Contribution) under the Paris Agreement to a 50 % reduction over the 2005–30 period, with a separate target of carbon neutrality by 2050.

The Biden administration also moved aggressively to reduce GHG emissions through sectoral policies. On vehicles, the EPA essentially restored the Obama GHG emissions rules for the 2023–26 model years and adopted additional rules for 2027–32. The latter require a reduction to 85 grams CO₂-equivalent/mile, which is half the rate in 2026 and is expected to require a 56 % sales share for electric vehicles in 2032. As mentioned in section 3.4, electric vehicles and renewable energy got a major boost when Congress passed the Inflation Reduction Act in 2022, which provides for 10 years of generous tax credits for electric vehicle purchases, vehicle charging stations, wind and solar power, battery storage, hydrogen, and carbon capture and storage. In a major 2021 infrastructure bill (the *Infrastructure Investment and Jobs Act*), Congress provided \$1.5 billion to state governments for electric vehicle charging infrastructure, leading all 50 states to create development plans. However, the impact of these policies on electric vehicle adoption is uncertain, as implementation faces challenges from a lack of charging capacity, consumer resistance, high vehicle prices, and increased tariffs on electric cars from China (St. John 2024).

Regulatory action has been ambitious in other areas, too. The EPA reinstated stricter Obama administration rules for methane emissions from landfills in 2021 and created new regulations to limit venting and flaring in the oil and gas industry in 2023 (Karapin/Vogel 2024: ch. 8). Congress passed a law and ratified an international agreement, the *Kigali Amendment* to the Montreal Protocol, directing the EPA to adopt regulations to phase

down HFC emissions by 85 % by 2047. In 2024, the EPA also adopted rules to require existing coal and new natural gas power plants to adopt carbon capture and storage technology. The total impact of these policies is estimated at about 610 megatons CO₂-equivalent in 2030, which is expected to help reduce U.S. emissions to 40 % below 2005 levels that year, an amount that is, however, well short of the United States' 50 % reduction target.⁴

5. The Interaction of State and Federal Climate Policy-Making

In what ways have the state and federal governments affected each other's climate policies? This question has already been addressed to a degree in section 3, since the definitions of the various types of federalism referred to there contain causal claims about interactions between state and federal governments. *Compensatory* policies occur when federal inaction motivates states to adopt climate policies. *Unilateral federal policies* may legally block states from acting. In *cooperative federalism*, federal policies lead to state actions that implement them. *Friendly competitive federalism* involves some tendency for positive feedback between state and federal policies. *Complementary* policies often involve indirect positive feedback between state and federal policies, since both support the growth of low-carbon industries, which in turn press for supportive policies. In *coercive federalism*, federal policy triggers political conflict between state and federal governments, leading either to state actions implementing the federal policy, or to blockage of the federal policy through litigation or electoral defeat of the incumbent president's party. Finally, in *unfriendly competitive federalism*, state policies trigger conflict with the federal government, with many outcomes possible, including the federal government blocking state action, states influencing federal policy adoption, and states winning or retaining autonomy.

While all these types of interaction coexist in the United States' *kaleidoscopic climate policy federalism*, several higher-level patterns can also be observed. First, presidential election results have led to an alternation between different types of state-federal policy-making relationships in some policy areas, though not others (see Tab. 2). This is because the federal role in climate policy is marked by intense partisan polarization and the rising importance of executive action in the face of congressional gridlock (Klyza/Sousa 2013). This produces an oscillation of federal policy between progress during Democratic administrations and stagnation or retrenchment when Republicans control the White House (Shafie 2020: ch. 6). During Republican presidential administrations (Bush, Trump), the federal government has retreated from climate policy by delaying regulations, weakening them, and cutting climate-related spending. In some policy areas, states have engaged in bursts of compensatory activities. In response, the federal government sometimes responded with unfriendly competition, as in motor vehicles.

4 This is the mid-range estimate compared to the *Frozen Policies* scenario, obtained by using the Data Explorer at repeatproject.org (24.04.2024).

By contrast, under Democratic administrations (Obama, Biden), the states and federal governments pursued a mix of complementary, unilateral federal, friendly competitive, and coercive policies, as the federal government caught up to the leading climate policy states.

However, this overarching pattern held in some policy areas more than others. It was clearly present for target setting, motor vehicle standards, electric vehicle sales quotas, and power plant standards. But it operated only to a small extent in emissions trading (the recent state-level reforms during the Trump administration) and appliance standards (since state standards for most products were preempted). And it was almost completely absent in electric vehicle and renewable energy tax credits, which were much less affected by the president's partisan affiliation.

Tab. 2: The impact of U.S. presidential elections on climate policy federalism

Presidential party Policy area	Democratic	Republican	Overall nature of state-federal interaction
<i>Target setting</i>	Friendly competitive	Compensatory	Some positive feedback
Emissions trading	Compensatory	Compensatory (stronger)	None
Renewable energy	Complementary; indirectly iterative	Complementary; indirectly iterative	Indirect positive feedback (through promotion of industry)
<i>Motor vehicle GHG standards</i>	Unilateral federal; with voluntary preemption	Unfriendly competitive	Bottom-up diffusion
<i>Electric vehicle sales quotas</i>	Compensatory; becoming iterative (combined with GHG standards)	Compensatory; perhaps becoming unfriendly competitive	Indirect positive feedback (through promotion of industry)
Electric vehicle tax credits	Complementary	Complementary	Unclear
Appliance efficiency standards	Unilateral federal; compensatory for some products	Unilateral federal; compensatory for some products	Bottom-up diffusion
Power plant standards	Compensatory; becoming a mix of cooperative and coercive	Compensatory	Bottom-up diffusion

Note: *Italicized* policy areas show clearly divergent patterns depending on the president's party.

Source: Own compilation.

A second higher-level pattern involves differences in bottom-up diffusion and positive feedback across policy areas (see the last column of Tab. 2). There was clear, strong bottom-up diffusion in vehicle standards, appliance standards, and power plant standards.

Under Obama, state standards for new power plants and vehicle GHG emissions led to federal standards beginning in 2010, and state appliance standards were diffused to the federal level through congressional legislation in 1987, 1992, 2005, and 2007. Moreover, there was also some positive feedback in target setting, and indirect positive feedback via the promotion of low-carbon industries through renewable energy and electric vehicle policies. State and federal GHG targets were both affected more by international agreements and the general climate policy discourse than they affected each other, but there was some positive feedback during the period from the Obama to the Biden administrations (Barichella 2023: 90).

By contrast, in renewable energy, there was no bottom-up diffusion of specific policies, since a national renewable portfolio failed repeatedly in the 2000s and Biden's proposed clean electricity standard was blocked by Senator Joe Manchin in 2021. However, indirect positive feedback occurred, as both state and federal policies promoted the wind and solar industries, and as those industries grew, their lobbying power and ability to create jobs helped create conditions for bipartisan tax credit extensions and increases in state renewable portfolio standards. In electric vehicle sales quotas and tax credits, state and federal governments indirectly affected each other by promoting the electric vehicle industry, and there is also recent positive feedback between state sales quotas and federal GHG emissions standards.

Finally, top-down diffusion occurred in none of these sectoral climate policy areas. Even in vehicles and appliances, the federal government has successfully imposed national rules on the car and appliance industries, not on state governments. A Biden administration attempt to require state governments to adopt declining CO₂ targets for their transportation sectors was struck down in federal court (Shepardson/Raymond 2024). However, the federalization of policy has involved the preemption of state policy-making in these areas and also in HFC regulation and methane regulation in the oil industry (Karapin/Vogel 2024: chs. 7–8). Finally, in emissions trading, there was no causal relationship between state and federal policy, since attempts at bottom-up diffusion failed with the Waxman Markey bill in 2009 and have not been revived.

6. The Impact of U.S.-style Federalism on Climate Policy

Does the United States' federal system block or foster climate policy-making? This chapter supports the view that it has mixed effects (Scruggs 2003; Braun 2000: 2ff.; Karapin 2020: 29; Fenna 2023: 5ff.; Rabe/Smith 2023: 307). On the one hand, U.S.-style federalism promotes compensatory innovation and bottom-up vertical diffusion. State governments have engaged in a substantial amount of compensatory activity, especially California and coalitions led by that state. State innovations have often diffused horizontally to other states (Bailey/Karapin 2024) and have led to federal regulatory policies in important areas such as vehicles and appliances. In a number of areas, there has also been a degree of positive feedback between state and federal policies, including indirectly through the promotion of low-carbon industries. Furthermore, state governments' climate policy activity shows much more continuity than that of the federal government, so in periods

of federal retrenchment under Republican presidents, the states help to stabilize U.S. climate policy as a whole.

However, federalism undermines U.S. climate policy in two other ways. It gives states much autonomy in many sectoral climate policy areas, but Republican-governed states do not adopt much climate policy. Moreover, those states as well as fossil-fuel producing states are over-represented in the U.S. Senate due to the constitutional over-representation of small-population states, which enhances the power of climate policy opponents to block federal climate legislation. Also, the electoral college bias toward small, conservative states may have affected the outcome of the 2000 presidential election and hence the course of climate policy during the George W. Bush administration (Brewer 2015: 138; Siaroff 2001).

At the same time, the United States' kaleidoscopic climate policy federalism involves a great diversity of changing relations between federal and state policy-making. These create opportunities for initiatives by a variety of political actors seeking to promote climate policy at both levels of government (Klyza/Sousa 2013).

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