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EVIDENCE REVIEW

Reviewing the Impact and Cost-Effectiveness of Local Climate Action within the United States

This publication summarizes a white paper: "Reviewing the Impact and Cost-Effectiveness of Local Climate Action within the United States: A Literature Review," by Teevrat Garg, Gordon McCord, Matthew Burditt, and Shelah Ott (University of California, San Diego).

OVERVIEW AND POLICY ISSUES

Local and state governments have become key drivers of climate action in the United States. More than half of the fifty largest cities in the US have adopted local climate action plans (CAPs) outlining strategies to reduce emissions and address climate-related impacts in their jurisdiction.[1] Beyond these CAPs, jurisdictions are also jointly developing regional program portfolios to share and address cross-municipal challenges and to motivate regional collaboration. These efforts underscore the growing leadership role of local governments in advancing climate action, particularly as federal priorities continue to shift and climate change worsens.

As local climate action becomes increasingly high-urgency, rigorous evidence can identify the most effective policy solutions and prevent common pitfalls in previously evaluated programs. It can also provide researchers with insights into gaps in the current knowledge base and unveil opportunities for new research in sectors essential for achieving decarbonization.

This evidence review summarizes a literature review of climate actions included in CAPs, focusing on rigorous experimental and quasi-experimental evaluations across five sectors: energy, transportation, solid waste, water and wastewater, and agriculture and conservation. We share key findings and highlight evidence gaps.

1 Ballotpedia, n.d.

KEY LESSONS

Research on local climate actions has focused heavily on energy efficiency and transportation programs, while evidence on solid waste, water and wastewater, and agriculture remains limited. In this section, we highlight key lessons from each of the focus areas presented throughout the rest of the evidence review. Together, the energy and transportation sectors are the largest sources of US greenhouse gas emissions: when accounting for residential and commercial energy use, the energy sector produces more than half of total emissions, with 25 percent coming from electric power generation alone, while transportation contributes about 28 percent.[2] Solid waste systems and water and wastewater infrastructure also add to the nation's emissions, though at much smaller levels, and agriculture contributes approximately 10.5 percent of total emissions.[3]

Energy efficiency - In the energy sector, research finds that programs often delivered smaller energy savings than originally estimated. Engineering models tended to overstate potential savings because they did not fully account for factors like increased energy use after installing efficient appliances or the low visibility of energy prices. This gap affects cost-effectiveness calculations and planning assumptions. Additionally, the impact of energy programs varies widely based on design details—such as who the program is designed for, how burdensome the application process is, timing, and how rules are bundled.

Research on renewable energy initiatives found that incentive and financing programs, such as rooftop solar subsidies and Property Assessed Clean Energy program (PACE) financing, successfully increased renewable energy adoption, although some installations would have occurred without support and rebound effects. Informational strategies, particularly those that leverage community networks and social learning, were also effective at increasing interest and uptake by reducing perceived barriers and encouraging peer influence.

Transportation - In the transportation sector, policies that directly change the economics of high-emission choices or clean alternatives have been found to drive the largest behavior shifts compared to light-touch nudges or information alone. Examples include congestion pricing, generous EV subsidies, and toll exemptions for zero-emission vehicles. More broadly, lasting emissions reductions require coordinated efforts. Evidence shows that combining instruments such as pricing, building standards, targeted subsidies, and streamlined processes, have created stronger and more durable impacts.

Solid waste - In this sector, most evidence focuses on sustainability measures such as unit-based pricing, plastic bag taxes, and informational nudges, which show mixed effectiveness and often produce unintended consequences. Rigorous studies on decarbonization strategies, such as composting programs and methane capture, are scarce. Many proposed actions, including zero-waste policies, landfill gas systems, and commercial interventions, remain unevaluated. Overall, a fraction of solid waste local climate actions have been rigorously studied, leaving major gaps in understanding what works for emissions reduction in the sector.

Water and wastewater - In water and wastewater, most existing evidence focuses on reducing household water use through informational nudges and rebate programs for efficient appliances. Providing households with information on their neighbors and their own water use has been proven the most effective in reducing water consumption. However, studies rarely measure greenhouse gas impacts, and little evidence exists on building codes, landscaping ordinances, or wastewater treatment efficiency.

Agricultural and conservation - In this sector, research is even more limited. Existing studies, mostly from Europe, show that payments to farmers can improve biodiversity and reduce chemical use, but cost-effectiveness varies and many farmers would have adopted some practices even without subsidies. Evidence on US programs, including tree planting, community gardens, and carbon sequestration initiatives, is scarce. Overall, these sectors lack rigorous evaluations of emissions outcomes, leaving critical gaps for designing effective climate policies.

2 U.S. Environmental Protection Agency, 2025.

3 U.S. Environmental Protection Agency, 2025.

METHODOLOGY

This publication synthesizes evidence from 161 peer-reviewed studies evaluating the effectiveness of climate actions outlined in CAPs or similar policy documents. The review focuses primarily on decarbonization, with additional attention to sustainability and resiliency efforts in the United States and other comparable high-income countries, including several studies from Europe, Australia, and New Zealand. All included studies were published after 2000 and employed rigorous experimental methodologies, including thirty randomized evaluations, eighteen regression discontinuity designs, thirteen natural experiments, and ninety quasi-experiments. Each study evaluated a clearly defined policy intervention aimed at influencing human behavior and achieving an environmental objective.

For this review, we grouped commonly observed CAP initiatives into five broad sectors: energy, transportation, solid waste, water and wastewater, and agriculture and conservation. These categories capture the most frequent types of interventions across CAPs. Among them, energy and transportation have the most robust bodies of experimental evidence.

Box 1. Why do rigorous methodologies matter when measuring impact in the climate space?

Accurately measuring emissions reductions is particularly challenging in the climate space. For example, a study in the journal *Nature Communications* found that the average error in reports of greenhouse gas emissions by local governments is nearly twenty percent.[4] Without reliable underlying data, assessing the true impact of any policy on emissions becomes difficult.

Reliable measurement is essential for progress toward greenhouse gas emissions targets. Rigorous methodologies can address this challenge by providing accurate measures on emissions reductions without the reliance on potentially inaccurate predictive models or formulas.

This review prioritizes studies that use credible identification strategies to draw causal conclusions. A study is considered credible if it establishes a clear counterfactual—what would have happened without the intervention—through experimental designs like randomized evaluations, regression discontinuity, natural experiments, or other quasi-experimental methods.

4 Schwartz, J. 2021.

Box 2. Measuring climate policy impact: Cost-effectiveness, marginal Emissions, and equity metrics

Across all sectors, studies in this review used inconsistent approaches to measuring cost-effectiveness and often overlooked other important measurement factors, such as the impact of marginal emissions, additionality (whether incentives reach people who would not have changed their behavior otherwise), and equity considerations. Randomized evaluations using standardized cost-effectiveness, environmental, and equity metrics provide a key opportunity for jurisdictions to prioritize resource allocation and contribute to decarbonization progress across North America.

Cost-effectiveness

Understanding the cost-effectiveness of programs is crucial for policymakers to identify which interventions are most impactful for a given cost. When cost-effectiveness is measured as the cost per metric ton of carbon dioxide reduced, it becomes easier to compare different interventions within and across sectors. To fully understand cost-effectiveness, research should account for marginal emissions—the extra emissions that come from the power plant supplying the next bit of electricity needed when making a switch to an EV, for example. This matters especially for interventions in transportation and energy. Limited research on fleet transition and energy savings found that programs were less effective in reducing emissions than originally projected and depended not only on how much energy is saved, but also on when those savings occur. Decreasing energy use during high-demand periods delivers greater economic and environmental benefits because electricity prices and the carbon intensity of the grid vary throughout the day. Programs that target peak periods, especially EV incentives and charging infrastructure, can therefore achieve more cost-effective emissions reductions.

Additionality

Additionality, whether programs influence behavior that would not have changed otherwise, is a key factor in the cost-effectiveness of CAP initiatives, though many evaluations in this review did not include additionality measurements. When incentives go to households that would have undertaken an action absent the intervention, cost-effectiveness declines. Additionality is most explored in the transportation sector, with evidence demonstrating that a substantial portion of EV purchases would have occurred without the incentives, thus reducing their cost-effectiveness. In agriculture, some farmers who received payments for cover crops and buffer strips would have adopted these practices without the financial support. However, payments for grass buffer strips still delivered meaningful environmental benefits, making them potentially cost-effective despite limited additionality.

Equity considerations

Current experimental evidence provides limited insight into equity considerations in climate actions, especially for the solid waste, water and wastewater, and agriculture and conservation sectors. In transportation, accelerating EV adoption across all income levels, for example, is key to decarbonizing the sector, yet only a few studies target low- and middle-income populations. In energy efficiency, most programs targeting low-income households—such as home retrofits—tie eligibility to income, while few interventions examine different energy efficiency incentive programs or various income groups, and those that do found results varied by income. As more programs target underrepresented communities, policymakers need representative evidence on participation, effectiveness, and differences across racial and economic groups to design policies that deliver equitable and cost-effective results.

EVIDENCE ON LOCAL CLIMATE ACTIONS

ENERGY

The energy sector produces more greenhouse gas emissions than any other sector when including emissions from residential and commercial buildings.[5] CAPs typically focused on two main areas: improving the energy efficiency of buildings and expanding renewable energy. In energy efficiency, evaluations focused on weatherization and home retrofits programs, appliance rebates and subsidies, and building standards. In renewable energy, studies examined solar subsidies, property assessed clean energy programs, and campaigns to raise awareness about renewable options.

Energy efficiency on buildings

Climate actions within this subsector targeted a range of groups, including owners of multi-family buildings and commercial businesses, renters, and single-family homeowners, with most efforts focused on the single-family homeowners. These CAP initiatives included incentives for purchases, mandatory requirements, and information campaigns to encourage energy-efficient upgrades and electrification.

The review covers more than forty studies, most of which examined incentive programs and building standards. Incentive programs offered rebates or direct installation of energy-efficient appliances, space cooling and heating systems, and home weatherization. Building standards included codes and benchmarking programs, as well as certifications such as LEED or ENERGY STAR, which either set minimum levels of energy efficiency or signal a building's energy efficiency level. Researchers typically measured changes in energy consumption, such as reductions in the use of natural gas or electricity.

5 U.S. Environmental Protection Agency. (2025).

Taken together, the evidence from these studies points to several key conclusions:

1. Programs delivered smaller energy savings than originally estimated. Engineering models tended to overstate potential savings because they did not fully account for:
   - The rebound effect, or the tendency to increase energy consumption after installing efficient appliances because operating costs are lower. This was more common in lower-income households.
   - Low visibility of energy prices: the prices of energy are not noticeable to consumers at the time of consumption, and consumers undervalue long-term savings from efficiency upgrades.
2. Incentive programs, such as rebates and tax credits, sometimes encouraged purchases that would not have happened otherwise (additionality), particularly for appliances like dishwashers, washing machines, and refrigerators.
3. Program impacts differed widely across the populations they targeted. Impacts varied based on factors such as the type of appliance subsidized, household income, baseline energy use, geographic location, and utility service area.

Appliances

Incentive programs for appliances such as efficient washing machiness, dryers, and dishwashers generally increased the adoption of these appliances.[6] However, some households simply moved up purchases they had already planned, a form of non-additionality which reduced the programs' cost-effectiveness.[7] Other incentives for more efficient air conditioning (AC) led to lower electricity use among households that installed these units. Savings varied depending on how electricity prices changed throughout the day.[8] In some cases, these price variations encouraged households to overinvest in high-efficiency AC (that is, the private benefit to the household exceeds the social benefit), especially under different electricity rate structures.[9]

Heating and home weatherization

Incentive programs for home weatherization and space heating were generally effective at reducing energy consumption. Nevertheless, many studies found that actual energy consumption savings were far less than originally projected.[10]

Recent research points to the role of contractors in shaping home weatherization program outcomes: the quality of installation can affect realized savings.[11] Despite this, contractor performance remains an understudied factor in building decarbonization.

6 Buettner and Madzharova, 2024; Datta and Gulati, 2014; Houde and Aldy, 2017.

7 Buettner and Madzharova, 2024; Datta and Gulati, 2014.

8 Boomhower, 2020.

9 Liang et al. 2021.

10 Allcott and Greenstone, 2017; Fowlie, 2018.

11 Christensen et al. 2023

Building standards

Studies on building codes—regulations that set minimum energy requirements for new and renovated buildings—showed mixed results.[12] Some research suggested codes helped reduce energy use, while others found little effect or note that improvements may reflect broader trends toward more efficient buildings over time.[13] In some cases, codes contributed to energy savings but also led to smaller housing sizes in lower-income communities.[14]

Studies of LEED in federal buildings and ENERGY STAR in commercial buildings found little impact on average energy use.[15] In some cases, efforts to meet LEED certification required prioritizing energy efficiency over water efficiency.[16] Other research suggests ENERGY STAR often signaled pre-existing efficiency rather than an incentive to invest further into making the building more energy efficient.[17]

Renewable energy

Actions in this subsector included measures to expand renewable energy within the county or city's energy mix. Most commonly, CAPs included incentive programs and, to a lesser extent, financing programs for boosting the adoption of renewable energy like rooftop solar or geothermal energy. There were also some measures to streamline solar permitting processes, expand local job training programs related to renewable energy, work with local partners to boost community renewables and storage, and expand green tariff programs or community choice aggregation.

Researchers identified twelve impact evaluations related to renewable energy, concentrated in the United States (specifically in California and Connecticut). The studies focused on state or local level incentive programs, such as the California Solar Incentive, and informational programs aimed at boosting the adoption of rooftop solar systems and increasing generation capacity.

Incentives and subsidies

While solar energy incentives increased the number of residential installations, some of these installations would have taken place without the incentive.[18] Evidence also suggests that the installation of a rooftop solar system within a neighborhood increased the probability of additional installations within that neighborhood.[19]

The Property Assessed Clean Energy program (PACE), a financing mechanism that allows property owners to finance rooftop solar investments through a special assessment on their property tax bill, was effective at boosting rooftop solar adoption rates.[20] However, one study concluded that these subsidies did not lead to a net reduction in carbon emissions, largely due to increases in energy usage after installation. Property owners relied on fossil-fuel-generated grid energy to cover gaps when their solar systems could not meet demand.[21]

Informational programs

Informational interventions varied widely in design and delivery, including social media ads, large-scale municipal campaigns, leveraging community ambassadors, community-based recruitment, group pricing, and different message framing. The common goal of all of these interventions was to increase rooftop solar adoption and the enrollment into green tariff schemes.

Informational programs were effective at increasing interest in renewable energy and in boosting installations. Research shows that using community ambassadors and social learning approaches were effective in increasing solar adoption, while group pricing lowered installation costs.[22] Other studies examined peer-to-peer solar programs, a scheme where rooftop solar system owners sell their excess energy to their neighbors. Researchers found that sharing green reports on social media increased interest in adoption.[23] This is an example of making a typically pro-social action visible—a behavior that benefits other people beyond the person engaging in the action.

When comparing messaging strategies, self-interest messages were more effective than pro-social appeals. Households who received self-interest messages were also found to install more productive systems.[24] Finally, offering symbolic rewards, such as municipal solar panels for reaching enrollment targets in green tariff programs, successfully motivated community members to recruit their neighbors.[25]

12 Bruegge et al. 2018; Jacobsen and Kotchen, 2010; Novan et al. 2022; Levinson, 2016.

13 Levinson, 2016.

14 Bruegge, 2018.

15 Clay et al. 2021; Brolinson et al. 2023.

16 Clay et al. 2021.

17 Brolinson et al. 2023.

18 Hughes and Podolefsky, 2015.

19 Bollinger and Gillingham, 2012.

20 Ameli et al. 2017; Kirkpatrick and Bennear, 2014; Winecoff and Gaff, 2020.

21 Winecoff and Gaff, 2020.

22 Gillingham and Bollinger, 2021.

23 Carattini et al. 2022.

24 Bollinger et al. 2020.

25 Jacobsen and Kotchen, 2013.

Evidence gaps

While energy efficiency in buildings has been widely studied, important gaps remain for measuring some common climate actions. For instance, there is a lack of experimental evidence on the effectiveness of programs for increasing energy efficiency, electrification, or renewable energy at the municipal level or in commercial buildings. Fuel-switching programs, designed to phase out propane or natural gas appliances, are also poorly understood. Few studies have examined impacts on renters and, while impacts on homeowners have been studied, evidence on training programs for homeowners to inform them on topics like energy efficiency, energy efficiency benchmarking, and available incentive programs remain absent. Finally, contractor-facing interventions remain a major gap despite recent findings that installation quality can significantly influence weatherization outcomes.[26]

Renewable energy shows even larger evidence gaps. Experimental evidence is limited and concentrated in two US states. Although CAPs include programs to streamline solar permitting and green workforce programs, research on these efforts is scarce. Similarly, no studies have evaluated programs aimed at boosting solar adoption at the community or commercial level. Evidence on green tariffs and community aggregation programs is also limited, even as these approaches are growing as alternatives to traditional investor-owned utilities.

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TRANSPORTATION

Transportation is the second most studied area and the second largest source of greenhouse gas emissions in the United States, driven primarily by on-road vehicles.[27] CAP initiatives in this sector generally focus on three main approaches. The first promotes electric vehicle (EV) adoption through purchase incentives, building public charging infrastructure, school bus electrification, and information provision programs. The second encourages using alternative modes of transportation via Safe Routes to School programs, educational campaigns, improved infrastructure, and zero-emission landscaping ordinances, which regulate emissions from gasoline-powered landscaping equipment. The third set of actions targeted emissions from jurisdictions by transitioning municipal fleets to EVs, adopting anti-idling policies (rules that limit how long vehicles can run while parked), offering transportation benefits to employees, and implementing education and incentive programs for staff.

Experimental evidence related to transportation is concentrated across three subsectors: fleet transition—which constitutes the largest body of research— traffic congestion or transportation demand management, and public transportation.

Fleet transition

Research on fleet transition centers on policies to phase out high-emitting vehicles, increase EV adoption, and encourage purchases of more fuel-efficient vehicles. Programs to expand EV adoption through incentives and install public charging infrastructure were the most frequently studied.

EV and hybrid purchase incentive programs

Studies consistently found that subsidies were largely effective at increasing EV adoption, but there are questions regarding the extent to which these incentives generate additional purchases that would not have occurred otherwise.[28] In addition to purchase subsidies, some research examined other incentives such as registration fee exemptions, value-added tax exemptions, reduced annual motor vehicle taxes, or fleet modernization programs.[29]

When comparing incentive types, direct purchase rebates were more effective at boosting adoption of battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs) than tax credits and sales tax waivers.[30] BEVs also responded more strongly to state subsidies than PHEVs, with no notable differences between manufacturers.[31]

Research on "Cash for Clunkers" programs offering subsidies for trading in older, less fuel-efficient vehicle purchases for newer, more fuel-efficient ones concluded that these subsidies led to an increase in fuel-efficient vehicle purchases.[32] However, many of these purchases would have occurred without the program, raising questions about cost-effectiveness.[33] Further research on a program that provided additional support to low- and middle-income households to replace their vehicles found that most participants who enrolled in the program would likely have purchased a slightly cleaner vehicle than the one they previously owned, even without the incentive.[34]

Finally, research did not find increases in energy consumption due to lower fuel prices when transitioning to EVs. There was no evidence of a rebound effect that would offset the fuel savings achieved through these programs.[35]

26 Christensen et al. 2023; Giraudet et al. 2018.

27 U.S. Environmental Protection Agency, 2025.

28 Clinton and Steinberg, 2019; Li et al. 2017; Muehlegger and Rapson, 2022; Narassimhan and Johnson, 2018; Springel, 2021.

29 Springel, 2021; Muehlegger and Rapson, 2022; Muehlegger and Rapson, 2023.

30 Clinton and Steinberg, 2019; Narassimhan and Johnson, 2018.

31 Narassimhan and Johnson, 2018.

32 West et al. 2015; Hoekstra et al. 2017; Li et al. 2013.

33 Hoekstra et al. 2017; Li et al. 2013.

34 Muehlegger and Rapson, 2022; Muehlegger and Rapson, 2023.

35 Hoekstra et al. 2017; West et al. 2015.

Fuel economy informational programs

Some studies found that informational nudges did not increase the average fuel efficiency of vehicles purchased,[36] while other research suggested that consumers undervalue fuel economy when purchasing vehicles.[37]

At-home EV off-peak charging

Nudges also failed to shift at-home EV charge timing to off-peak hours to reduce strain on the grid. However, financial incentives did influence charging behavior, but the effect disappeared once regular rates were reinstated.[38] This was the only paper in the review to study EV charging time, despite its high relevance to decarbonizing the transportation sector and mitigating emissions from the grid.

Public EV charging infrastructure

Across six evaluations, building public EV charging infrastructure led to higher EV adoption.[39] Beyond this direct effect, studies explored several related questions: the adoption of different types of EVs, the interaction between EV adoption programs and charging network expansion, the impact of investing in areas without existing infrastructure, and whether building charging infrastructure in new locations is more effective than increasing the number of connectors at existing ones.

On EV types, studies show that the impact of charging infrastructure is greater on adoption of BEVs than on PHEVs.[40] Regarding program interaction, some studies estimate that about forty percent of the increase in EV sales was driven by the combined effect of adoption programs and charging infrastructure rather than either intervention alone.[41] Other research found that expanding the lineup of EV models tends to strengthen overall EV adoption and is complementary to investments in charging infrastructure.[42]

Evaluations also highlight the importance of charging location. Providing public charging infrastructure in remote and rural municipalities, especially those without any existing stations, had a strong impact on EV adoption.[43] Building new stations tended to have a greater effect than adding connectors to existing sites.[44]

36 Allcott and Knittel, 2019.

37 Gillingham et al. 2021.

38 Bailey et al. 2023.

39 Li et al. 2017; Narassimhan and Johnson, 2018; Schulz and Rode, 2022; Sommer and Vance, 2021; Springel, 2021; van Dijk et al. 2022.

40 Narassimhan and Johnson, 2018; Sommer and Vance, 2021.

41 Li et al. 2017.

42 Springel, 2021.

43 Schulz and Rode, 2022; Dijk et al. 2022.

44 Dijk et al. 2022.

Traffic congestion and transportation demand management

Experimental evidence on traffic congestion has focused mainly on policies designed to reduce single-passenger vehicle use by encouraging commuters to shift toward cleaner transportation alternatives. Among transportation demand management programs, air quality alerts are the most studied interventions, followed by incentives, behavioral nudges, tolls and congestion pricing, and vehicle use restrictions. Findings in this subsector are mixed and should be interpreted with caution, as the existing research base is still relatively small.

Air quality alerts

Air quality alerts interventions mainly consisted of public advisory programs. Their effects on traffic congestion and public transportation demand were minimal. Research on Spare the Air in San Francisco and Ozone Action Day in Chicago found little impact on public transit use or demand for car travel and carpooling.[45] Some studies found small decreases in traffic volume and shifts in hourly ridership patterns to less crowded times of the day.[46]

Transportation demand management incentives

Informational nudges and monetary incentives generally did not change commuting behavior.[47] Research concluded that financial incentives, including free bus trials and personalized travel plans, or informational nudges such as emails or letters alone had no detectable impact, while combining both had the most potential. However there were still limited behavioral shifts.[48] Surveys also revealed gaps between what commuters reported and their actual travel choice.

Public transportation

Public transportation research centers on programs that aim to increase ridership and improve the rider experience by reducing congestion during peak transit times and shortening wait times. Experimental evidence has mostly evaluated public transit subsidies, though studies also examined the effectiveness of real time information and the role of public transit complements and substitutes.[49] Overall, public transit systems are effective in reducing congestion. Subsidies generally increased transit use as expected, while real-time information showed mixed results, boosting ridership in some cases.[50]

45 Cutter and Neidell, 2009; Sexton, 2012; Welch et al. 2005.

46 Cutter and Neidell, 2009.

47 Rosenfield et al. 2020, Kristal and Whillans, 2019.

48 Rosenfield et al. 2020.

49 Brakewood et al. 2014.

50 Brakewood et al. 2014, Hahn et al. 2023; Davis, 2021.

Transit pricing and subsidies

Impact evaluations in this subsector estimate effects on transit ridership, traffic congestion, welfare, and gasoline consumption. Subsidies were effective in changing transit use.[51] Research suggests that congestion relief benefits—the monetary savings resulting from reduced traffic congestion—can be substantial. Researchers found congestion relief benefits equivalent to up to 50 percent of the subsidy amount in the Netherlands, and about US$1.20–4.10 per peak-hour transit passenger mile in Los Angeles.[52] These benefits were strongest during weekday rush hours on inner-city roads, even in less congested cities.[53] By contrast, reducing train fares had limited impact on gasoline consumption, while lowering highway speed limits did.[54]

Real-time information

Real-time information had mixed effects on public transit ridership, depending on the program location. In New York City and Chicago, the provision of real time information increased weekday bus ridership, primarily in larger routes.[55] By contrast, in Tampa, Florida, real time information did not shift the volume of bus trips but did decrease wait times and improved rider satisfaction.[56]

Public transportation complements and substitutes, and bikeshare infrastructure

Bikesharing—an affordable service offering shared bicycles and e-bikes—reduced the number of riders using public transit, while Uber tended to complement transit agencies in the United States, indicating that riders used Uber alongside public transportation rather than as a substitute.[57] Expanding the bikeshare network increased the frequency of use by annual members of the bikeshare program and reduced traffic congestion.[58]

Evidence gaps

While there is evidence on some programs identified in climate action plans, more than half of the proposed actions remain unstudied. Programs with no experimental evidence include efforts to increase EVs in jurisdiction fleets, using zero-emission construction equipment, and other initiatives to reduce emissions from jurisdictions' operations. They also include landscaping and construction programs, and roadway infrastructure improvements intended to encourage public transit and other clean transit options. Most existing studies focus on large metropolitan areas, leaving transportation decarbonization programs in rural settings largely unexplored.

51 Hahn et al. 2023; Davis, 2021.

52 Adler and van Ommeren, 2016; Anderson, 2014.

53 Adler and van Ommeren, 2016.

54 Asensio et al. 2014.

55 Brakewood et al. 2015; Tang and Thakuriah, 2012.

56 Brakewood et al. 2014.

57 Hall et al. 2018; Campbell and Brakewood, 2017.

58 Wang and Lindsey, 2019; Hamilton and Wichman, 2018.

Few studies reported cost-effectiveness analyses, which are crucial for informing policy decisions. Even in subsectors with substantial research, like EV adoption, gaps remain, including the effects of interventions on low- and middle-income households, newer subsidy programs, and information campaigns about incentives and other interventions.

SOLID WASTE

The solid waste sector contributes to greenhouse gas emissions mainly through methane released as organic waste decomposes in landfills. While methane remains in the atmosphere for less time than carbon dioxide, its global warming potential can be up to eighty times greater. Although some local climate actions have focused on reducing methane emissions, most are related to sustainability. Decarbonization efforts include programs to divert organic recyclables, reduce food waste in commercial businesses, expand local composting, and invest in large-scale methane capture systems at landfills. Sustainability actions have aimed at reducing single-use plastic bag usage and addressing hard-to-recycle materials like clothing, wooden pallets, and construction and demolition waste.

Experimental evidence has largely focused on sustainability measures, similar to local climate actions. Most studies examined residential waste diversion through programs such as unit-based pricing—where households pay for trash recollection based on the amount of waste they produce—single-use plastic bans and taxes, and informational nudges. More recent research has evaluated decarbonization-related outcomes through the provision of organic waste bins to increase composting or using carbon footprint labels on food choices, but these studies are limited. Most of the evidence comes from Europe, with few studies in the United States and Australia. The effectiveness of these approaches is mixed.

Unit-based pricing

Under this scheme, households are charged based on the amount of garbage they produce using different tracking systems. Unit-based pricing programs were found to be highly effective at reducing unsorted solid waste and increasing the amount sorted for recycling or composting.[59] These effects persisted over time, as households who received the intervention consistently reduced unsorted solid waste.[60] Weight-based pricing systems were more effective than volume-based systems for reducing waste because they discouraged compressing garbage to fit into smaller containers.[61]

59 Allers and Hoben, 2010; Bueno and Valiente, 2015; Bucciol et al. 2015; Carattini, 2018; Usui and Takeuchi, 2014.

60 Carattini, 2018; Usui and Takeuchi, 2014.

61 Allers and Hoben, 2010.

Single-use plastic bans and taxes

Taxes on single-use plastic bags have been effective in reducing their use, while bans show mixed results.[62] Some studies found that bans created unintended incentives, such as offering thicker plastic bags unregulated by the ban.[63] Other research found bans effective at reducing single-use plastic bag consumption but noted an increase in paper bag use in response, which can have a higher emissions footprint. Pairing bans with fees on paper bags was more effective at reducing overall disposable bag use.[64] Taxes reduced the likelihood of using disposable plastic bags and increased the likelihood of using reusable plastic bags, while bonus incentives for reusable bags did not increase reusable bag adoption.[65] Both taxes and bans can have unintended consequences, such as longer wait times and queues at grocery stores.[66]

Informational nudges

Informational nudges in CAPs included strategies such as clear trash bag policies, which encouraged the use of take-out bags, visual cues, and charitable donations when people chose not to use plastic bags. Nudges were generally effective at reducing unsorted waste.[67] When comparing approaches, social norm messages were impactful while creating default options did not boost the use of take-out bags.[68] Prosocial feedback, such as smiley or sad faces, tended to increase recycling more than social comparisons, although social comparisons had the most impact on households that previously did not recycle.[69] The impact of nudges varied by socio-demographic characteristics, with stronger effects among lower-income and less-educated populations.[70] While some effects persisted over time, continuous exposure to the nudges is important for sustaining behavior change.[71]

Waste diversion behavioral nudges

Recent research has examined solid waste programs aimed at reducing greenhouse gas emissions. Examples include providing organic waste bins to increase composting and sorted waste and adding carbon footprint labels on food packaging. Supplying organic waste bins generally reduced unsorted waste and increased sorted waste, though in some instances, effects were limited to organic garden waste. Others reported little impact in areas with methane capture facilities at landfills.[72] By contrast, in one study, adding carbon footprint labels to food sold in a cafeteria failed to influence people's choices toward lower-carbon meals.[73]

Evidence gaps

Experimental evidence in the solid waste sector has important gaps compared to the amount of local CAP initiatives in the sector. About twenty percent of proposed actions have been studied, including technical assistance programs, resources to increase sorted waste, and efforts to reduce contamination and improve recycling effectiveness. Most existing evidence was produced in Europe, with very little research conducted in the United States.

Climate actions with no evidence include municipal zero-waste policies, green purchasing policies, landfill gas systems installations, educational interventions on the use of low-carbon materials, and incentives for building composting facilities and increasing sorted waste of food and hard-to-recycle materials. Compost production and application programs, such as community composting or using compost instead of fertilizer, also lack evidence. Similar to the energy and transportation sectors, commercial interventions remain largely unevaluated, except for single-use plastic bag taxes and bans. Few studies have examined the impact of waste programs on decarbonization outcomes.


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WATER AND WASTEWATER

Climate actions in this area often include wastewater recycling programs and measures to improve water efficiency, increase conservation, and promote reuse. Local initiatives typically focus on providing information, setting landscape requirements, and mandating water-saving measures in buildings. While many climate actions link water conservation efforts to emissions reduction targets, these outcomes are not usually specified. Likewise, research on water conservation initiatives typically does not measure decarbonization effects explicitly. Studies instead have centered around water savings and, in some cases, the cost-effectiveness of residential water conservation programs, including informational campaigns and financial incentives. Most research was conducted in the United States.

62 Cabrera et al. 2021; Homnoff, 2018; Homnoff et al. 2022; Taylor, 2020; Taylor and Villas-Boas, 2016.

63 Homnoff et al. 2022.

64 Homnoff et al. 2016; Taylor and Villas-Boas, 2016.

65 Homnoff, 2018.

66 Taylor, 2020.

67 Akbulut-Yuksel and Boulatoff, 2021; Cotterill et al. 2009; Giaccherini et al. 2021; Lotti et al. 2023; Nomura et al. 2011; Penn et al. 2021.

68 Giaccheri et al. 2021.

69 Nomura et al. 2011.

70 Akbulut and Boulatoff, 2021.

71 Cotterill et al. 2009; Akbulut and Boulatoff, 2021.

72 De Silva and Taylor, 2024; Sommers, 2025.

73 Lohmann et al. 2022.

Informational nudges

Nudge interventions focused on providing technical information, pro-social messages, and social comparisons of water use with neighbors. Among these approaches, social comparisons, such as showing households how their water use or water savings compared to their neighbors, were the most effective at reducing household water consumption, and impacts lasted over time.[74] Pro-social messages also reduced water use, while technical information alone had little effect.[75] When evaluating how nudges impact engagement with existing utility water programs and their effects on other conservation efforts, researchers concluded that combining home water reports with social comparisons not only reduced water consumption, but also increased the likelihood of participating in other conservation programs and reduced electricity use.[76] High-income households, homeowners, and heavy water users were more responsive to these informational programs.[77]

Financial incentives

Most impact evaluations have focused on rebate programs for water-saving technologies such as high-efficient toilets, washing machines, or irrigation controllers. These incentives generally reduced residential water consumption.[78] Some studies found that people were encouraged to purchase appliances they would not have acquired otherwise, while others suggested this was not always the case—particularly for high-efficiency toilets.[79]

Evidence gaps

There are significant gaps in this area. Little evidence exists on water-efficiency measures in government-owned buildings and operations, new building standards, or outdoor landscaping ordinances. Programs such as wastewater treatment efficiency initiatives, building codes for existing development projects, and efforts to distinguish the impacts on homeowners versus renters have no experimental evidence. More research is also needed in geographically diverse locations, as most existing studies come from Georgia and California. Importantly, the effects of water and wastewater on greenhouse gas emissions remain unexplored.

74 Brent et al. 2015; Brent et al. 2020; Bernedo et al. 2014; Bhanot, 2021; Bonan et al. 2024; Ferraro and Price, 2011; Jessoe et al. 2021.

75 Ferraro and Price, 2011.

76 Brent et al. 2015, Bonan, 2024.

77 Brent et al. 2015; Brent et al. 2020; Ferraro and Price, 2011, Ferraro and Miranda, 2013.

78 Brelsford and Abbott, 2021; Pérez-Urdiales and Baerenklau, 2019.

79 Bennear et al. 2013; Pérez-Urdiales and Baerenklau, 2019.

AGRICULTURE AND CONSERVATION

CAPs in this area often include efforts to increase carbon storage through incentives and frameworks to preserve or restore natural lands. They also include community greening programs, such as tree-planting initiatives, educational campaigns, and efforts to conserve native trees. Additionally, climate farming programs seek to promote carbon farming, community gardens, and incentives for farms that reduce greenhouse gas emissions and increase sequestration (the process of capturing carbon dioxide from the atmosphere and storing it in the soil). Climate actions also include the Purchase of Agricultural Conservation Easement (PACE), a program that operates in several US states, which allows governments or land trusts to buy development rights from farmers or landowners.

Carbon-farming programs

Carbon-farming programs compensate farmers for adopting environmental farming practices, such as converting land to organic farming, reducing herbicide use, and diversifying crops. Most existing evidence on carbon farming comes from European agri-environmental schemes (AESs). Payments were generally effective in achieving several outcomes, including expanding conservation and cover crop areas, maintaining grasslands, increasing organic farming, and reducing the use of herbicides, pesticides, and synthetic fertilizers.[80]

The cost-effectiveness of these interventions was mixed. One study found carbon-farming programs effective when payments were larger than five percent of farmers' income, while another study concluded that costs were high compared to the environmental benefits.[81]

80 Arata and Sckokai, 2016; Bartolini et al. 2021; Bertoni et al. 2020; Kuhfuss and Subervie, 2018; Pufahl and Weiss, 2009; Wuepper and Huber, 2022.

81 Arata and Sckokai, 2016; Bertoni, 2020.

The impact of carbon farming programs varied depending on the outcomes measured:[82]

1. Both payments for adopting a specific practice and payments for achieving an intended outcome were effective in increasing biodiversity conservation.[83]
2. Farms that generated the largest benefits were more likely to enroll in these programs.[84]
3. Increasing payments improved environmental outcomes when payments were calculated per hectare, but not when calculated per farm.[85]
4. Some farmers who received payments for cover crops and buffer strips would have changed their behavior without these payments.[86] However, compensation for grass buffer strips still produced important environmental benefits. In contrast, farmers who received subsidies to convert to organic farming would not have made this change without the payment.

Agricultural land conservation

Evidence in this subsector is limited, but existing research has investigated the impact of informational nudges and Purchase of Development Rights (PDR) programs designed to prevent farmland from being converted to impervious developed land (such as roads, parking lots, or buildings). PDR programs significantly reduced the rate of farmland loss in participating counties.[87] Informational nudges were effective at encouraging farmers to re-enroll in conservation programs but had little impact on attracting new participants.[88]

Evidence gaps

This is the least studied sector in the evidence review, with only three of seventeen of the climate actions having related research. Research has not examined programs such as tree planting, community gardens, voluntary manure management, incentives for cleaner fuels in agriculture operations, initiatives to preserve natural lands that could serve as carbon sinks, or interventions in government-owned lands. There is also little evidence from the United States, with most existing studies examining programs in Europe.

The agricultural sector plays a major role in climate change and varies widely across regions in its challenges and needs, making experimental evidence especially important. While many local climate actions were developed to enhance carbon sequestration and strengthen natural carbon sinks, experimental evidence has not evaluated their impact on reducing greenhouse gas emissions.

82 Bartolini et al. 2020; Chabé-Ferret and Subervie, 2013; Pufahl and Weiss, 2009; Wuepper and Huber, 2022

83 Wuepper and Huber, 2022.

84 Pufahl and Weiss, 2009.

85 Bartolini et al. 2020.

86 Chabé-Ferret and Subervie, 2013.

87 Liu and Lynch, 2011.

88 Wallander et al. 2017.

CONCLUSIONS

As climate change worsens and the US federal landscape evolves, state and local governments' role becomes more crucial. As they work on their own CAPs and join regional decarbonization efforts, experimental research will play an important role in helping policymakers understand and identify the most cost-effective programs. Implementing the right programs is critical as climate funding resources are scarce.

This literature review maps the climate actions relevant to policymakers, offering a comprehensive understanding of the empirical support behind strategies they plan to implement. While CAPs often center around energy efficiency, transportation, solid waste, water and wastewater, and agriculture and conservation, existing experimental evidence primarily addresses the first two. In the energy and solid waste sectors, most studies focus on single-family homes and homeowners or landlords, with few examining impacts on commercial buildings or renters. Transportation research largely covers EV programs and incentives, but evidence for low- and middle-income households is scarce. Agriculture and conservation is the sector with the least experimental evidence overall.

The gaps identified in this review highlight opportunities for researchers to strengthen the evidence base that supports high-impact climate actions at the local level. There is still much to learn about effective local climate strategies. More research is needed on consistent measures of cost-effectiveness, the role of marginal emissions, whether incentives reach people who would not have changed their behavior otherwise, and equity considerations within interventions.

About J-PAL North America

J-PAL North America is a regional office of the Abdul Latif Jameel Poverty Action Lab (J-PAL), a global network of researchers who use randomized evaluations to answer critical policy questions in the fight against poverty. Our mission is to reduce poverty by ensuring that policy is informed by scientific evidence.

For further reading:

This publication summarizes a white paper: “Reviewing the Impact and Cost-Effectiveness for Local Climate Action within the United States: A Literature Review” by Teevrat Garg, Gordon McCord, Matthew Burditt, and Shelah Ott (University of California, San Diego).

APPENDIX

Table A1. Studies on energy

Study	Methodology	Location	Category
Adan, H., and Fuerst, F. (2016).	Differences-in-differences	United Kingdom (Nationwide)	Energy efficiency on buildings: weatherization and space heating
Alberini, A., and Towe, C. (2015).	Quasi-experiment	United States (Maryland)	Energy efficiency on buildings: space heating
Allcott, H., and Greenstone, M. (2017).	Randomized control trial	United States (Wisconsin)	Energy efficiency on buildings: heating and home weatherization
Allcott, H., and Rogers, T. (2014).	Randomized control trial	United States (Midwest/West Coast)	Energy efficiency on buildings: conservation
Allcott, H., and Sweeney, R. (2014).	Randomized control trial	United States (Nationwide)	Energy efficiency on buildings: water heating
Ameli, N., Pisu, M., and Kammen, D. M. (2017).	Natural experiment	United States (California)	Renewable energy: solar
Andor, M. A., Gerster, A., and Peters, J. (2022).	Differences-in-differences	Germany	Energy efficiency on buildings: conservation
Andor, M. A., Gerster, A., Peters, J., and Schmidt, C. M. (2020).	Randomized control trial	Germany	Energy efficiency on buildings: conservation
Asensio, O. I., and Delmas, M. A. (2016).	Randomized control trial	United States (California)	Energy efficiency on buildings: conservation
Asensio, O. I., Churkina, O., Rafter, B. D., and O'Hare, K. E. (2024).	Staggered difference in difference	United States (New York)	Energy efficiency on buildings: weatherization and space cooling
Attari, S. Z., Gowrisankaran, G., Simpson, T., and Marx, S. M. (2014).	Difference-in-differences	United States (New York)	Energy efficiency on buildings: conservation
Aydin, E., Kok, N., and Brounen, D. (2017).	Two-way fixed effects and quasi-experimental	Netherlands (Nationwide)	Energy efficiency on buildings: building standards
Ayres, I., Raseman, S., and Shih, A. (2009).	Field experiment	United States (Washington/California)	Energy efficiency on buildings: conservation
Bernard, L., Hackett, A., Metcalfe, R. D., and Schein, A. (2024).	Differences-in-differences	United Kingdom (Nationwide)	Energy efficiency on buildings: space heating
Blonz, J. A. (2023).	Differences-in-differences	United States (California)	Energy efficiency on buildings: appliances
Blonz, J., Palmer, K., Wichman, C. J., and Wietelman, D. C. (2025).	Randomized control trial	Canada (Ontario)	Energy efficiency on buildings: conservation
Boampong, R. (2020).	Differences-in-differences	United States (California)	Energy efficiency on buildings: space cooling
Bollinger, B., and Gillingham, K. (2012).	Two-way fixed effects first differences	United States (California)	Renewable energy: solar
Bollinger, B., Gillingham, K. T., and Ovaere, M. (2020).	Natural field experiment	United States (Connecticut)	Renewable energy: solar
Boomhower, J. P., and Davis, L. W. (2017).	Difference-in-differences	United States (California)	Energy efficiency on buildings: space cooling
Boomhower, J., and Davis, L. W. (2014).	Regression discontinuity	Mexico (Nationwide)	Energy efficiency on buildings: appliances and space cooling
Boomsma, M., Vringer, K., and Soest, D. van. (2025).	Randomized control trial	Netherlands	Energy efficiency on buildings: conservation

Study	Methodology	Location	Category
Brandon, A., Clapp, C. M., List, J. A., Metcalfe, R. D., and Price, M. (2022).	Difference-in-Differences	United States (California)	Energy efficiency on buildings: space Heating and cooling
Brolinson, B., Palmer, K., and Walls, M. (2023).	Difference-in-Differences	United States (Nationwide)	Energy efficiency on buildings: building standards
Bruegge, C. D., Deryugina, T., and Myers, E. (2018).	Difference-in-Differences	United States (California)	Energy efficiency on buildings: building standards
Buettner, T., and Madzharova, B. (2024).	Difference-in-differencess	European Union (Hungary, Austria, and Croatia)	Energy efficiency on buildings: appliances
Carattini, S., Gillingham, K., Meng, X., and Yoeli, E. (2024).	Randomized control trial	United States (Massachusets)	Renewable energy: solar
Cassidy, A. (2023).	Difference-in-differences	United States (Texas)	Energy efficiency on buildings: building standards
Christensen, P., Francisco, P., and Myers, E. (2023).	Randomized control trial	United States (Illinois)	Energy efficiency on buildings: weatherization
Chuang, Y., Delmas, M. A., and Pincetl, S. (2022).	Difference-in-differences	United States (California)	Energy efficiency on buildings: appliances, weatherization, space cooling
Clay, K., Severnini, E. R., and Sun, X. (2021).	Difference-in-differences	United States (Nationwide)	Energy efficiency on buildings: building standards
Costa, D. L., and Kahn, M. E. (2010).	Field experiment (difference-in-differences)	United States (Unidentified State)	Energy efficiency on buildings: conservation
Coyne, B., and Denny, E. (2021).	Panel with one-way fixed effects	Ireland (Nationwide)	Energy efficiency on buildings: space heating and weatherization
Coyne, B., and Denny, E. (2021).	Difference-in-differences	Ireland (Nationwide)	Energy efficiency on buildings: space heating and weatherization
Datta, S., and Gulati, S. (2014).	Two-way fixed effects	United States (Nationwide)	Energy efficiency on buildings: appliances
Davis, L. W., Fuchs, A., and Gertler, P. (2014).	Difference-in-differences	Mexico (Nationwide)	Energy efficiency on buildings: appliances and space cooling
Delmas, M. A., and Lessem, N. (2014).	Two-way fixed effects	United States (California)	Energy efficiency on buildings: conservation
Elinder, M., Escobar, S., and Petré, I. (2017).	Difference-in-differences	Sweden (Stockholm)	Energy efficiency on buildings: standards
Fowlie, M., Greenstone, M., and Wolfram, C. (2015).	Randomized encouragement design/ difference-in-differences	United States (Michigan)	Energy efficiency on buildings: weatherization and space heating
Frondel, M., Gerster, A., and Vance, C. (2020).	Two-way fixed effects with instrumental variable	Germany (Nationwide)	Energy efficiency on buildings: standards
Gao, X., Canfield, C., Tang, T., Hill, H., Higman, M., and Cornwell, J. (2022).	Difference-in-differences with propensity score matching	United States (Nationwide)	Renewable energy: solar
Germeshausen, R., von Graevenitz, K., and Achtnicht, M. (2022).	Geographic discontinuity design	Germany (Nationwide)	Energy efficiency on buildings: standards
Giandomenico, L., Papineau, M., and Rivers, N. (2022).	Systematic review of studies	Various	Energy efficiency on buildings: weatherization
Gill, C., and Lang, C. (2018).	Difference-in-differences	United States (New England)	Energy efficiency on buildings: conservation
Gillingham, K., and Bollinger, B. (2020).	Randomized control trial	United States (California)	Renewable energy: solar
Gillingham, K., Keyes, A., and Palmer, K. (2018).	Systematic review of studies	Various	Energy efficiency on buildings

Study	Methodology	Location	Category
Gillingham, K., Rapson, D., and Wagner, G. (2016).	Systematic review of studies	Various	Energy efficiency on buildings: rebound effect
Giraudet, L.-G., Houde, S., and Maher, J. (2018).	Difference-in-differences	United States (Florida)	Energy efficiency on buildings: weatherization
Grimes, A., Preval, N., Young, C., Arnold, R., Denne, T., and Howden-Chapman, P. (2016).	Difference-in-differences	New Zealand (Nationwide)	Energy efficiency on buildings: weatherization
Hammerle, M., and Burke, P. J. (2022).	Two-way fixed effects	Australia (Canberra)	Energy efficiency on buildings: space cooling and heating
Hancevic, P. I., and Sandoval, H. H. (2022).	Difference-in-differences	United States (California)	Energy efficiency on buildings: space cooling and weatherization
Harding, M., and Hsiaw, A. (2014).	Staggered difference-in-differences	United States (Illinois)	Energy efficiency on buildings: conservation
Henry, M. L., Ferraro, P. J., and Kontoleon, A. (2019).	Difference-in-differences	United States	Energy efficiency on buildings: conservation
Henry, M. L., Ferraro, P. J., and Kontoleon, A. (2019).	Randomized control trial	United States	Energy efficiency on buildings: conservation
Hondeborg, D., Probst, B., Petkov, I., and Knoeri, C. (2023).	Difference-in-differences	Switzerland (Nationwide)	Energy efficiency on buildings: weatherization
Houde, S., and Aldy, J. E. (2017).	Difference-in-differences	United States (Nationwide)	Energy efficiency on buildings: appliances
Houde, S., Todd, A., Sudarshan, A., Flora, J. A., and Armel, K. C. (2013).	Randomized control trial	United States (California)	Energy efficiency on buildings: conservation
Hughes, J. E., and Podolefsky, M. (2015).	Two-way fixed effects regression discontinuity	United States (California)	Renewable energy: solar
Ito, K. (2015).	Regression discontinuity	United States (California)	Energy efficiency on buildings: conservation
Jacobsen, G. D., and Kotchen, M. J. (2010).	Regression discontinuity	United States (Florida)	Energy efficiency on buildings: standards
Jacobsen, G. D., Kotchen, M. J., and Clendenning, G. (2013).	Two-way fixed effects	United States (Connecticut)	Renewable energy: renewable procurement
Jessoe, K., and Rapson, D. (2012).	Randomized control trial	United States (Connecticut)	Energy efficiency on buildings: conservation
Kirkpatrick, A. J., and Bennear, L. S. (2014).	Difference-in-differences with synthetic counterfactual	United States (California)	Renewable energy: renewable procurement
Kotchen, M. J. (2015).	Regression discontinuity	United States (Florida)	Energy efficiency on buildings: standards
Levinson, A. (2016).	Difference-in-differences	United States (California)	Energy efficiency on buildings: standards
Liang, J., Qiu, Y., and Xing, B. (2021).	Two-way fixed effects	United States (Arizona)	Energy efficiency on buildings: space cooling
Liang, J., Qiu, Y., James, T., Ruddell, B. L., Dalrymple, M., Earl, S., and Castelazo, A. (2018).	Difference-in-differences	United States (Arizona)	Energy efficiency on buildings: weatherization and space cooling
List, J. A., Metcalfe, R. D., Price, M. K., and Rundhammer, F. (2017).	Randomized encouragement design	United States (North-East)	Energy efficiency on buildings: conservation
Marangoni, G., and Tavoni, M. (2021).	Panel with one-way fixed effects	Italy (Isernia)	Energy efficiency on buildings: conservation
Martin, S., and Rivers, N. (2018).	Two-way fixed effects	Canada (Ontario)	Energy efficiency on buildings: conservation

Study	Methodology	Location	Category
McCoy, D., and Kotsch, R. A. (2021).	Difference-in-differences	United Kingdom (Nationwide)	Energy efficiency on buildings: weatherization and space heating
Myers, E., and Souza, M. (2020).	Randomized control trial	United States (Illinois)	Energy efficiency on buildings: conservation
Myers, E., Puller, S. L., and West, J. D. (2019).	Difference-in-differences	United States (Texas)	Energy efficiency on buildings: standards
Neumann, O., Gonin, A., Pfalzgraf, M., and Patt, A. (2023).	Field experiment	Switzerland	Renewable Energy: Solar Energy
Novan, K., and Smith, A. (2018).	Difference-in-differences	United States (California)	Energy efficiency on buildings: space cooling
Novan, K., Smith, A., and Zhou, T. (2022).	Regression discontinuity	United States (California)	Energy efficiency on buildings: standards
Papineau, M., and Rivers, N. (2022).	Difference-in-differences	Canada (Alberta)	Energy efficiency on buildings: conservation
Pellerano, J. A., Price, M. K., Puller, S. L., and Sánchez, G. E. (2017).	Randomized control trial	Ecuador (Quito)	Energy efficiency on buildings: conservation
Schleich, J., Schuler, J., Pfaff, M., and Frank, R. (2023).	Difference-in-differences	Germany (Nationwide)	Renewable energy: renewable procurement
Sejas-Portillo, R., Moro, M., and Stowasser, T. (2025).	Regression discontinuity	United Kingdom (Nationwide)	Energy efficiency on buildings: appliances
Shen, X., Qiu, Y. L., Liu, P., and Patwardhan, A. (2022).	Difference-in-differences	United States (North Carolina)	Energy efficiency on buildings: space heating
Stojanovski, O., Leslie, G. W., Wolak, F. A., Huerta Wong, J. E., and Thurber, M. C. (2020).	Difference-in-differences	Mexico (Puebla)	Energy efficiency on buildings: conservation
Sudarshan, A. (2017).	Difference-in-differences	India (Capital Region)	Energy efficiency on buildings: conservation
Suter, J. F., and Shammin, M. R. (2013).	Two-way fixed effects	United States (Ohio)	Energy efficiency on buildings: weatherization
Ta, C. L. (2024).	Difference-in-differences	Vietnam (Northern)	Energy efficiency on buildings: conservation
Winecoff, R., and Graff, M. (2020).	Difference-in-differences	United States (California)	Renewable energy: solar
Zivin, J. G., and Novan, K. (2016).	Difference-in-differences	United States (California)	Energy efficiency on buildings: weatherization

Table A2. Studies on transportation

Study	Methodology	Location	Category
Adler, M. W., and van Ommeren, J. N. (2016)	Quasi-natural experiment	Netherlands (Rotterdam)	Public transportation
Allcott, H., and Knittel, C. (2019)	Randomized control trial	United States (Nationwide)	Fleet transition
Anderson, M. L. (2014).	Regression discontinuity design	United States (Los Angeles, CA)	Public transportation
Asensio, J., Gómez-Lobo, A., and Matas, A. (2014).	Natural experiment (two-way fixed effects)	Spain	Public transportation
Bailey, M. R., Brown, D. P., Shaffer, B. C., and Wolak, F. A. (2023).	Randomized control trial	Canada	Fleet transition
Brakewood, C., Macfarlane, G. S., and Watkins, K. (2015).	Natural experiment (two-way fixed effects)	United States (New York)	Public Transportation
Campbell, K. B., and Brakewood, C. (2017).	Difference-in-differences	United States (New York)	Public Transportation
Chandra, A., Gulati, S., and Kandlikar, M. (2010).	Quasi-experiment	Canada	Fleet Transition
Clinton, B. C., and Steinberg, D. C. (2019).	Difference-in-differences with synthetic controls	United States (Nationwide)	Fleet Transition
Currie, J., and Walker, R. (2011).	Difference-in-differences	United States (New Jersey and Pennsylvania)	Traffic Congestion / Transportation Demand Management
Cutter, W. B., and Neidell, M. (2009).	Regression discontinuity design and difference-in-differences	United States (San Francisco, CA)	Traffic Congestion / Transportation Demand Management
Davis, L. W. (2021).	Regression discontinuity design	Mexico (Mexico City, Guadalajara, and Monterrey)	Public Transportation
Foreman, K. (2016).	Difference-in-differences and regression discontinuity design	United States (California)	Traffic Congestion / Transportation Demand Management
Gillingham, K. T., Houde, S., and van Benthem, A. A. (2021).	Difference-in-differences	United States (Nationwide)	Fleet Transition
Guerra, E., and Millard-Ball, A. (2017).	Regression discontinuity design	Mexico (Mexico City)	Traffic Congestion / Transportation Demand Management
Hahn, R., Hendren, N., Metcalfe, R., and Sprung-Keyser, B. (2024).	Marginal value of public funds (MVPF) framework	Various	Fleet Transition
Hahn, R. W., Metcalfe, R. D., and Tam, E. (2023).	Difference-in-differences	United States (California)	Public Transportation
Hall, J. D., Palsson, C., and Price, J. (2018).	Difference-in-differences	United States (Nationwide)	Public Transportation
Hamilton, T. L., and Wichman, C. J. (2018).	Quasi-experiment (propensity score matching / two-way fixed effects)	United States (Washington, D.C.)	Public Transportation
Hoekstra, M., Puller, S. L., and West, J. (2017).	Regression discontinuity	United States (Texas)	Fleet Transition
Janson, M., and Levinson, D. (2014).	Field experiment	United States (Minnesota)	Traffic Congestion / Transportation Demand Management
Kristal, A. S., and Whillans, A. V. (2019).	Randomized controlled trial	UK (nationwide)	Traffic Congestion / Transportation Demand Management
Li, S., Linn, J., and Spiller, E. (2013).	Difference-in-differences	United States (Nationwide)	Fleet Transition
Li, S., Tong, L., Xing, J., and Zhou, Y. (2017).	Quasi-experiment	United States (Nationwide)	Fleet Transition

Study	Methodology	Location	Category
Mouwen, A., and van Ommeren, J. (2016).	Quasi-experiment (two-way fixed effects)	Netherlands	Public Transportation
Muehlegger, E. J., and Rapson, D. S. (2023).	Difference-in-differences	United States (California)	Fleet Transition
Muehlegger, E., and Rapson, D. S. (2022).	Difference-in-differences	United States (California)	Fleet Transition
Narassimhan, E., and Johnson, C. (2018).	Quasi-experiment (two-way fixed effects)	United States (Nationwide)	Fleet Transition
Rosenfield, A., Attanucci, J. P., and Zhao, J. (2020).	Randomized controlled trial	United States (Massachusets)	Traffic Congestion / Transportation Demand Management
Schulz, F., and Rode, J. (2022).	Natural experiment (Event Study)	Norway	Fleet Transition
Sexton, S. E. (2012).	Regression discontinuity Design	United States (San Francisco, CA)	Traffic Congestion / Transportation Demand Management
Sheldon, T. L., and DeShazo, J. R. (2017).	Quasi-experimental (generalized propensity score matching)	United States (California)	Fleet Transition
Sommer, S., and Vance, C. (2021).	Quasi-experiment (two-way fixed effects with Instrumental Variable)	Germany	Fleet Transition
Springel, K. (2021).	Quasi-experiment	Norway	Fleet Transition
Tang, L., and Thakuriah, P. (Vonu). (2012).	Difference-in-differences	United States (Chicago, Illinois)	Public Transportation
van Dijk, J., Delacrétaz, N., and Lanz, B. (2022).	Quasi-experiment (two-way fixed effects with Synthetic Control)	Norway (Nationwide)	Fleet Transition
Wang, J., and Lindsey, G. (2019).	Difference-in-differences	United States (Minnesota)	Public Transportation
Welch, E., Gu, X., and Kramer, L. (2005).	Quasi-experiment (two-way fixed effects)	United States (Chicago, Illinois)	Traffic Congestion / Transportation Demand Management
West, J., Hoekstra, M., Meer, J., and Puller, S. L. (2015).	Regression discontinuity design	United States (Texas)	Fleet Transition

Table A3. Studies on solid waste

Study	Methodology	Location	Category
A. Allers, M., and Hoeben, C. (2010).	Differences-in-differences	Netherlands (Nationwide)	Waste diversion
Akbulut-Yuksel, M., and Boulatoff, C. (2021).	Regression discontinuity design	Canada (Nova Scotia)	Municipal solid waste
Alacevich, C., Bonev, P., and Söderberg, M. (2021).	Difference-in-differences	Sweden (Partille)	Waste diversion
Alonso-Paulí, E., Balart, P., Ezquerra, L., and Hernandez-Arenaz, I. (2025).	Randomized control trial	Spain (Palma de Mallorca)	Waste diversion
Bell, J., Huber, J., and Viscusi, W. K. (2017).	Differences-in-differences	United States (Wisconsin)	Municipal solid waste
Bucciol, A., Montinari, N., and Piovesan, M. (2015).	Difference-in-differences	Italy (Treviso)	Municipal solid waste
Bueno, M., and Valente, M. (2019).	Difference-in-differences with synthetic controls	Italy (Trento)	Municipal solid waste
Cabrera, J. M., Caffera, M., and Cid, A. (2021).	Difference-in-differences	Uruguay (Nationwide)	Plastic Bags
Carattini, S., Baranzini, A., and Lalive, R. (2018).	Difference-in-differences staggered	Switzerland (Vaud)	Municipal solid waste
Castaldo, C., Giaccherini, M., Pallante, G., and Palma, A. (2025).	Field experiment	Italy (Nationwide)	Food waste
Costa, D. L., and Kahn, M. E. (2010).	Randomized controlled trial	England	Municipal solid waste
De Silva, L., and Taylor, R. L. C. (2024).	Difference-in-differences	Australia (New South Wales)	Municipal solid waste
Ek, C., and Miliute-Plepiene, J. (2018).	Difference-in-differences	Sweden	Food waste
Giaccherini, M., Gilli, M., Mancinelli, S., and Zoli, M. (2021).	Difference-in-Differences	Italy (Turin)	Food waste
Homonoff, T. A. (2018).	Difference-in-differences	United States (Washington, D.C. metropolitan area)	Plastic Bags
Homonoff, T., Kao, L.-S., Selman, J., and Seybolt, C. (2021).	Difference-in-differences	United States (Chicago)	Plastic Bags
Katare, B., Wetzstein, M., and Jovanovic, N. (2019).	Difference-in-differences	United States (Midwest)	Food waste
Kim, G.-S., Chang, Y.-J., and Kelleher, D. (2008).	Two-way fixed effects	South Korea (Nationwide)	Waste diversion
Lotti, L., Barile, L., and Manfredi, G. (2023).	Difference-in-differences	United Kingdom	Food waste
Nomura, H., John, P. C., and Cotterill, S. (2011).	Randomized controlled trial	United Kingdom (Oldham, Greater Manchester)	Food waste
Penn, J., Bastola, S., and Hu, W. (2022).	Difference-in-differences	United States (Kentucky)	Plastic bags
Pfister, N., and Mathys, N. A. (2022).	Difference-in-differences	Switzerland (Vaud)	Waste diversion
Picchio, M. (2023).	Difference-in-differences	Italy (Marche)	Waste diversion
Somers, J. C. (2025).	Quasi-experiment	United States (Texas)	Waste diversion
Romano, G., and Masserini, L. (2023).	Difference-in-differences with propensity score matching	Italy (Nationwide)	Waste diversion
Taylor, R. L. C. (2020).	Quasi-experiment	United States	Plastic Bags
Taylor, R. L., and Villas-Boas, S. B. (2016).	Quasi-experiment	United States (California)	Plastic Bags
Usui, T., and Takeuchi, K. (2014).	Two-way fixed effects	Japan (Nationwide)	Waste diversion

Table A4. Studies on water and wastewater

Study	Methodology	Location	Category
Bennear, L. S., Lee, J. M., and Taylor, L. O. (2013).	Difference-in-differences	United States (Cary, NC)	Water conservation
Bernedo, M., Ferraro, P. J., and Price, M. (2014).	Randomized control trial	United States (Atlanta, GA)	Water conservation
Bhanot, S. P. (2021).	Randomized control trial	United States (San Francisco Bay Area, CA)	Water conservation
Bollinger, B., Burkhardt, J., and Gillingham, K. T. (2020).	Randomized field experiment	United States (San Francisco Bay Area, CA)	Water conservation
Bonan, J., Cattaneo, C., d'Adda, G., Galliera, A., and Tavoni, M. (2024).	Randomized controlled trial	Italy (Milan)	Water conservation
Brelsford, C., and Abbott, J. K. (2021).	Difference-in-differences	United States (Las Vegas, NV)	Water conservation
Brent, D. A., Cook, J. H., and Olsen, S. (2015).	Randomized controlled trial	United States (California)	Water conservation
Brent, D. A., Lott, C., Taylor, M., Cook, J., Rollins, K., and Stoddard, S. (2020).	Randomized field experiment	United States (Reno, NV)	Water conservation
Daminato, C., Diaz-Farina, E., Filippini, M., and Padrón-Fumero, N. (2021).	Difference-in-differences	Spain (Canary Islands)	Water conservation
Ferraro, P. J., and Miranda, J. J. (2013).	Randomized controlled trial	United States (Atlanta, GA)	Water conservation
Ferraro, P. J., and Price, M. K. (2013).	Difference-in-differences	United States (Atlanta, GA)	Water conservation
Ferraro, P. J., Miranda, J. J., and Price, M. K. (2011).	Randomized controlled trial	United States (Atlanta, GA)	Water conservation
Jessoe, K., Lade, G. E., Loge, F., and Spang, E. (2021).	Randomized controlled trial	United States (Burbank, California)	Water conservation
Pérez-Urdiales, M., and Baerenklau, K. A. (2019).	Quasi-experiment (propensity score matching)	United States (Southern California)	Water conservation

Table A5. Studies on agriculture and conservation

Study	Methodology	Location	Category
Arata, L., and Sckokai, P. (2016).	Difference-in-differences and propensity score matching	Europe (Spain, Germany, UK, Italy, France)	Carbon farming
Bartolini, F., Vergamini, D., Longhitano, D., and Povellato, A. (2021).	Natural experiment (generalized propensity score matching)	Italy (Veneto)	Carbon farming
Bertoni, D., Curzi, D., Aletti, G., and Olper, A. (2020).	Difference-in-differences	Italy (Lombardy)	Carbon farming
Chabé-Ferret, S., and Subervie, J. (2013).	Difference-in-differences	France (Nationwide)	Carbon farming
Kuhfuss, L., and Subervie, J. (2018).	Difference-in-differences	France (South)	Carbon farming
Lohmann, P. M., Gsottbauer, E., Doherty, A., and Kontoleon, A. (2022).	Field experiment	UK (University of Cambridge)	Carbon farming
Liu, X., and Lynch, L. (2011).	Propensity score matching	United States (six states)	Carbon farming
Pufahl, A., and Weiss, C. R. (2009).	Difference-in-differences propensity score matching	Germany (Nationwide)	Carbon farming
Richter, F. J., Suter, M., Lüscher, A., Buchmann, N., El Benni, N., Feola Conz, R., Hartmann, M., Jan, P., and Klaus, V. H. (2024).	Natural experiment	Switzerland (Nationwide)	Carbon farming
Wallander, S., Ferraro, P., and Higgins, N. (2017).	Field experiment	United States	Carbon farming
Wuepper, D., and Huber, R. (2022).	Difference-in-differences	Switzerland (Nationwide)	Carbon farming

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