

Commentary

Seizing the policy opportunities for health- and equity-improving energy decisions

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The Inflation Reduction Act (IRA), together with other US federal policies, offers a unique window of opportunity to promote health and equity goals through clean energy investments. Seizing these near-term opportunities to realize sizable synergies requires strategic actions from federal, state, and local actors.

Investing in low-carbon energy technologies can provide immediate local-to-regional co-benefits by reducing air pollution, improving human health, and providing new job opportunities.¹ Recent US federal actions offer promising opportunities to improve health and equity outcomes through clean energy investments. The Inflation Reduction Act (IRA) has unlocked unprecedented funding to accelerate the deployment of low-carbon technologies, such as renewable electricity, electric vehicles (EVs), and heat pumps.² It also emphasizes support for energy communities that have been historically dependent on fossil fuels and disproportionately burdened by air pollution. Concurrent federal initiatives also directly tackle health and equity issues. For instance,

the recently tightened National Ambient Air Quality Standards (NAAQS) for long-term exposure to fine particulate matter provide an additional push to mitigate air pollution through the clean energy transition.³

Despite the potential for policy synergies, there is little practical public guidance on how to maximize health and equity co-benefits through these energy decisions. The IRA programs, for instance, are managed by many different federal agencies and include a diverse portfolio of financial incentives such as tax credits, grants, loans, and financing programs, each with different implications for health and equity (Figure 1). Some programs, such as the Climate Pollution Reduction Grants, will likely have greater

direct environmental benefits due to state and local implementation and wider sectoral coverage. In addition, the design of the programs may further influence the scale of co-benefits. Some programs explicitly consider health and equity as key policy objectives (labeled as “Anticipated synergy” in Figure 1). For instance, the Department of Energy’s (DOE) Loan Program Office asks for a Community Benefits Plan to ensure the proposed energy projects will bring local benefits and address environmental justice and broader distributional goals. In the meantime, other programs have the potential to improve health and equity outcomes if implemented strategically (labeled as “Potential synergy” in Figure 1). For instance, multiple programs include a

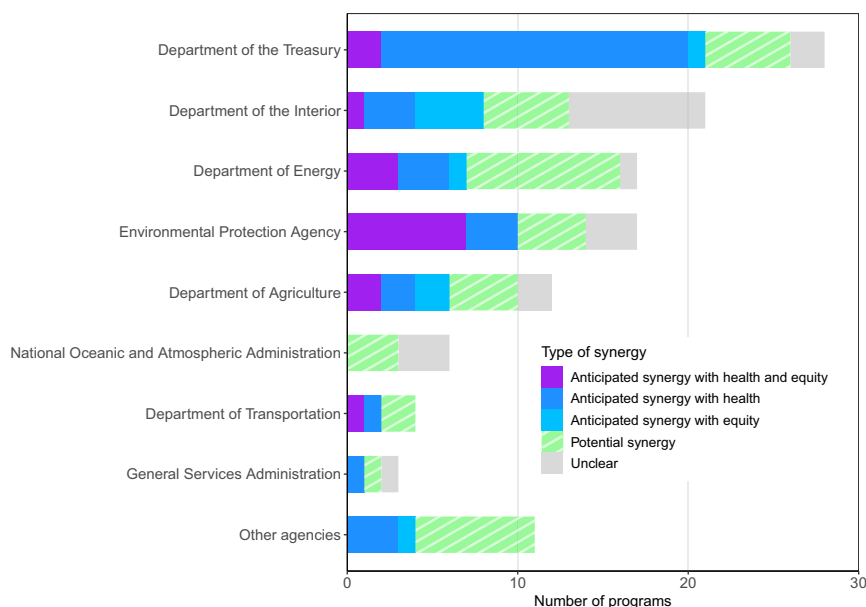


Figure 1. Number of IRA programs that have anticipated or potential synergy with health and equity objectives

We label a program to have *anticipated* synergy when health or equity is mentioned explicitly as a primary goal of the program. We label a program to have *potential* synergy when the co-benefits depend on implementation details (e.g., many programs include a loose guideline that they will give high priority to low-income communities, but achieving equity-improving outcomes depends on successfully directing more funding to these communities during the implementation process). We label a program to have *Unclear* synergy when no obvious co-benefits are expected. Here, we include eight federal agencies with the largest number of IRA programs. We then group other federal agencies (shown as “Other agencies”), including Council on Environmental Quality, Department of Homeland Security, Federal Energy Regulatory Commission, Department of Housing and Urban Development, Federal Permitting Improvement Steering Council, Government Accountability Office, Office of Management and Budget, and the US Postal Service. See [Data S1](#) for detailed labeling and justification. The raw data is from the Inflation Reduction Act Tracker.⁴ All the data and codes used to plot [Figure 1](#) are available from: <https://doi.org/10.5281/zenodo.14280164>.

general guideline to prioritize disadvantaged communities when allocating the funds, but the actual allocation of funding to those communities will require deliberate engagement efforts to ensure those communities are aware of relevant opportunities and have the capacity to apply for those funds. In short, the likelihood that equitable and affordable co-benefits will be created largely hinges on implementation. While many programs are still at an early stage, empirically tracking and assessing the effectiveness of these programs can inform policy design that realizes greater co-benefits and directs public funds more efficiently.

With a new federal administration in 2025, we can reasonably expect policy changes to IRA implementation. Yet, as many IRA-funded projects are underway, some of the business and job opportunities and pollution reductions are already benefiting communities.⁵ These benefits, coupled with the need to secure our en-

ergy future, could create or strengthen the constituencies in support of continued progress in the coming years.

In addition, state and local actions will become increasingly important considering the policy uncertainty at the federal level. This shifting emphasis toward bottom-up actions aligns well with the need for place-based solutions, as each region has unique histories, contexts, needs, and concerns. For instance, compared to a baseline scenario in 2030, an all-of-society energy transition—i.e., combining enhanced clean energy actions from federal, state, and local actors—is estimated to reduce national CO₂ emissions by 32% and pollution-related deaths by 10%.⁶ But the potential for CO₂ mitigation and health co-benefits varies substantially across states ([Figure 2](#)). Generally, greater potential is found in states with a large population and economy (e.g., California and Texas). Local energy patterns further affect which sectoral and policy

actions can generate more health benefits. For instance, for the states with a fossil-heavy grid (e.g., Texas, Ohio, and Pennsylvania), replacing coal power with cleaner sources has a greater potential to bring health co-benefits. For states that have already made significant progress toward decarbonizing their grid, other sectors provide more promising opportunities to pursue co-benefits, such as accelerating the transition to electric vehicles (e.g., in California) and shifting from biomass, fossil oil, and gas to electricity for heating (e.g., in New York). Recognizing these regional differences, tools and analyses need to be customized to the specific context to inform localized energy policies for better health and equity outcomes. Turning research insights into feasible energy actions further requires identifying policy designs that are compatible with existing institutional structures and likely to receive public support.

Navigating a complex decision-making landscape

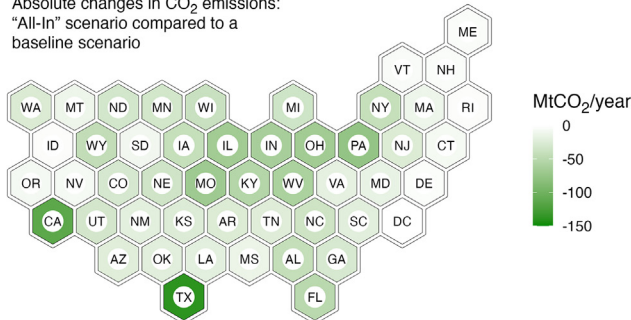
To understand policy opportunities and research needs, we brought together a group of scholars and practitioners from universities, federal and state agencies, think tanks and nonprofit organizations, and public and private funding entities for an in-person workshop in September 2023. Our group deliberations helped identify three key challenges in navigating the complex decision-making landscape.

Mitigating undesirable tradeoffs

The energy transition will create winners and losers and introduce potential tradeoffs between economic, health, and equity objectives.⁷ Despite the overall job and health benefits from deploying clean energy, communities that traditionally rely on fossil fuel production or use may lose significant economic activities supporting the local area.⁸ Complementary policy efforts that provide these communities with the needed support are important to increase policy acceptance and ensure an equitable transition. In addition, maximizing the health benefits to disadvantaged communities may require infrastructure designs with higher capital and operational costs, such as early retirement of fossil units close to these communities and adding needed transmission capacity to provide reliable and affordable electricity for everyone.⁹ Therefore, how

A Climate benefits from clean energy policy

Absolute changes in CO₂ emissions: "All-In" scenario compared to a baseline scenario



B Health benefits from clean energy policies

Absolute changes in 2030 PM_{2.5}-attributable deaths: "All-In" scenario compared to a baseline scenario

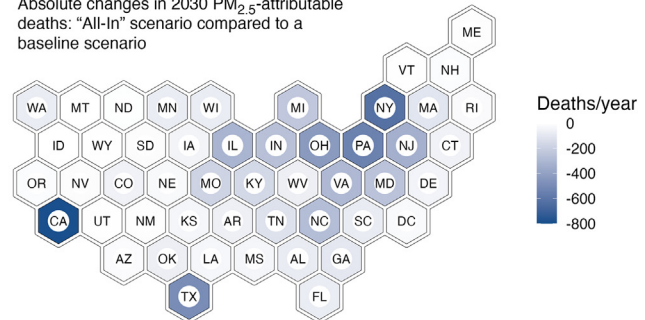


Figure 2. Projected state-level climate and health benefits in 2030 from clean energy policies

(A–B) (A) and (B) show the CO₂ mitigation benefits and air pollution-related health benefits in the “All-in” scenario compared to a baseline scenario in 2030. The baseline scenario is a counterfactual scenario that includes policies that have been on the books for a while but excludes recent programs such as the IRA. The “All-in” scenario not only combines all the policies on the books, including successful implementation of IRA programs, but also assumes enhanced climate actions from federal, state, city, and other subnational actors to collectively reduce 50%–52% nationwide GHG emissions by 2030 relative to 2005 level. This figure is replotted based on the results for the 2030 “All-in” and “No Climate Policy” scenarios in Peng et al.⁶ All the data and codes used to plot **Figure 2** are available from: <https://doi.org/10.5281/zenodo.14280164>.

to coordinate and combine efforts across regions and sectors to address these tradeoffs is a central question in energy decision-making.

Coordinating diverse actors and policy processes

Energy policies like the IRA impact industries, firms, and households differently. Since these diverse actors also have different incentives, priorities, and political power, the uneven impacts from policies can influence how well each policy measure is supported and implemented, which shapes the eventual policy outcomes. In addition, the policymaking processes for energy, air quality, and health are led by different government agencies, and this makes policy coordination difficult. For instance, while a wide range of federal agencies manage IRA-related programs (**Figure 1**), the EPA is the primary federal agency responsible for air quality management efforts. This means that efforts to pursue synergies, such as investing in low-carbon energy and reducing air pollution, require coordination across agencies with distinct regulatory responsibilities, processes, and timelines.

Aligning near-term actions with long-term goals

Many IRA programs have tight, near-term deadlines.⁴ The urgency for state and local actors to act quickly typically requires them to use off-the-shelf datasets and tools, which often lack the capability to compare the potential long-term effects of policy measures. For example,

different low-carbon strategies (e.g., electrification vs. bioenergy) have different long-term potential to mitigate CO₂ and health impacts and can bring benefits and costs to different industries and communities.^{10,11} Policy measures today also vary in how they may shape future policies through, for instance, accelerating technology innovation or enhancing public support.¹² Aligning near-term decisions with long-term goals thus requires a thoughtful deliberative process involving decision makers, researchers, and various stakeholders, which is sometimes in tension with the need to act quickly.

Laying the foundations for coordinated policy making

To tackle these challenges, we highlight three priorities to leverage current policy opportunities and to help lay the foundation for more coordinated policy making in the future.

Investing in engaged research to understand energy policy tradeoffs

There are still important knowledge gaps in understanding how energy policy designs may result in tradeoffs between different objectives and across population groups. Combining insights from various disciplines is needed to understand this complex problem. In addition to the techno-economic and benefit-cost analyses that have been used widely in energy policy assessments, we need new analytical frameworks that integrate methods and insights from multiple research disciplines,

including air quality and other environmental research to characterize pollution patterns at hyperlocal scales, public health research to understand energy and socio-environmental determinants of health disparities, and social and decision sciences research to compare various policy designs. Furthermore, generating actionable knowledge will not be possible without close collaborations with societal actors, particularly at local scales, to identify what is socially desirable and feasible. Depending on the nature of the decision, key stakeholders can range from federal, state, and local governments to businesses and community members. The current policy programs offer a promising entry point for researchers to support immediate decision-making needs. Strategically organizing these initial efforts to cultivate long-term partnerships between researchers, decision makers, and community groups is crucial, as trusted relationships take time and effort to develop.

Identifying key actors and strategies for mitigating tradeoffs

Our group discussions helped us converge on a general framework, organized through a set of structured questions, to identify potential strategies to mitigate tradeoffs and the key actors implementing those strategies (**Figure 3**). For scholars, this framework can be used to develop more decision-relevant research by strategically targeting which decisions to consider, which actors to consult, and, based on their concerns, what impacts and tradeoffs to assess. For

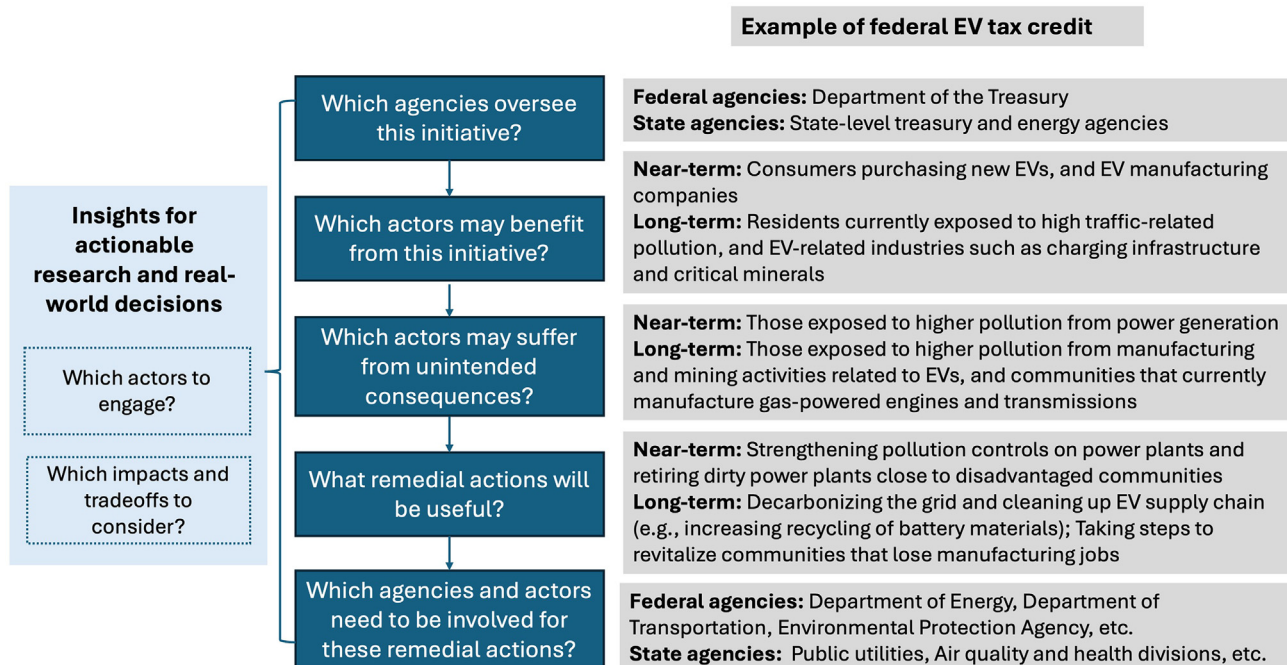


Figure 3. A general framework with a set of structured questions to help identify key actors and strategies to mitigate tradeoffs between climate, health, and equity goals

Identifying relevant actors and actions through questions in the figure will be particularly useful for the leading agencies (first question) to organize their policy consultation and formulation processes. The case study here focuses on federal tax credits for electric vehicles (EVs). This framework can be applied to policy initiatives at the state and local level, too.

decision-makers, this framework can offer useful insights to identify who and what to include in their policy consultation and formulation processes. Some stakeholders and concerns may not be obvious, due to the cross-regional and -sectoral impacts and the potential long-term dynamics. Making this framework more useful in practice will also depend on the type of decisions being considered and the right timing and process. For federal programs, the public comment and consultation process might be an appropriate place to deliberately solicit relevant feedback from key industry and community groups. For state and local-level decisions, this framework can be used to identify priorities for community engagement activities, such as what information to provide in the outreach and educational programs and how to collaborate with and empower community groups through advisory boards or other co-developed pilot programs.

Improving the scientific understanding and institutional partnerships needed to implement complementary policies

Carefully assessing and coordinating policy actions across sectors, regions, and

government bodies can help navigate policy tradeoffs. Yet, most studies to date have focused on assessing and comparing individual policy choices.^{13,14} To inform coordinated decisions, we need a deeper understanding of ways to combine and sequence policies and assess the effectiveness and feasibility of different policy packages. For decision makers, the importance of coordinating policy actions also elevates the need for new partnerships and collaborations across institutions that may not be common at present. For instance, cross-agency collaborations will be essential to coordinate actions and align respective timelines. At the federal level, collaboration by the EPA and DOE can help to better incorporate air quality and health objectives into energy decisions. For instance, the newly established Hydrogen Interagency Task Force is a great example of coordinated efforts across agencies to develop a national hydrogen strategy that considers equity and health goals.¹⁵ At the state level, creating inter-agency initiatives (including city and county entities) and public-private partnerships that facilitate collaboration

across different branches will be useful to implement synergistic actions that are aligned with local priorities and administrative capabilities. Since energy decisions often impact multiple states, existing programs that promote cross-state collaboration, such as the Regional Greenhouse Gas Initiative, could provide useful platforms to engage multiple states and explore ways to improve policy coordination.

Conclusion

Carefully designed energy strategies can lead us toward a healthier and more equitable future. Focusing on the US, we illustrate how the IRA and other federal policies create a window of opportunity to empower local communities and initiate partnerships for coordinated action on energy, health, and equity goals. Even with federal policy uncertainties under the incoming US administration and beyond, focusing on local and state policies and benefits (an overarching theme of the IRA) will continue to be a key to creating supportive constituencies and mobilizing society-wide efforts for a clean energy transition.

Looking beyond the US, other countries may find other opportunities that fit with their priorities and policy agendas. For China, this could be deliberately incorporating air quality and health impacts into the design and assessment of the industrial policy aimed at supporting electric vehicles and renewable technologies. For India, this could be prioritizing the switch to cleaner cooking and heating to reduce air pollution and accelerate rural electrification. The key to developing actionable solutions is to engage with societal actors who understand the real-world barriers and to incorporate interdisciplinary research insights that are embedded in local contexts.

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AUTHOR CONTRIBUTIONS

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Draft and Funding Acquisition: W.P. Visualization: W.P. and X.H. Writing – Review & Editing: All authors, led by W.P., M.B., C.H., K.K., N.S., and V.S.

DECLARATION OF INTERESTS

The authors declare no competing interests.

SUPPLEMENTAL INFORMATION

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