How and why we think about systems change as a climate funder

Reflections on Giving Green's research process and results

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Summary

This report aims to explain what Giving Green means by systems change, why we believe it represents the best opportunity for climate donors, and how the design of our research process enables us to assess the impact of systems change interventions. By sharing these reflections, we hope to encourage increased transparency across philanthropy, build shared learning and best practices, encourage donors who may be newer to funding systems work to deepen their commitments, and maximize our collective impact on the climate crisis.

What do we mean by systems change? We think of systems-change strategies as those that "change the rules of the game." In other words, funding systems change means funding work that ultimately changes incentives and actions beyond the project being funded. Examples include policy advocacy, technology innovation, market shaping, and strategic grassroots efforts to build political will. We observe that there is a spectrum rather than a binary when differentiating systems-change strategies from non-systems-change strategies.

What are important considerations when considering systems change? The impact of a systems change intervention is often difficult to “measure” at its early stages when funding can be most critical and catalytic. Efforts to evaluate early-stage systems change efforts encounter parameters with high uncertainty, factors that are sensitive with respect to timescales, and broad or not well-defined boundary conditions. Given that standard metrics and quantification tools may not lend themselves to these characteristics, we think it is important to develop a research framework that is broad enough to capture systems impacts, general enough to be applied across diverse interventions, and rigorous enough to allow others to critically examine our research and conclusions. Under such a framework, we are confident that systems change interventions are the best bets for maximizing expected impact.

Why do we think it is important that climate philanthropy supports systems change? We believe that solving climate change is fundamentally a systems problem. Philanthropy is uniquely well-positioned to fund systems change as it can take a relatively unconstrained, global, and holistic inventory of progress and dynamically fill gaps left by other sectors. For example, we think that funding systems change work complements the funding available on the voluntary carbon market, which predominantly consists of quantifiable, near-term emissions reduction or avoidance with clear project boundaries.

What are some key learnings from our experience assessing systems change work? Understanding the factors influencing past systems-change successes in climate, such as solar photovoltaics and the Inflation Reduction Act, has enabled us to better evaluate today’s systems interventions. Key considerations we recommend for funders are (i) embracing uncertainty and considering secondary effects and (ii) contextualizing strategies, initiatives, and projects under a theory of change that demonstrates a path to broader impact.

Introduction

Less than 2% of global philanthropy goes to climate change mitigation, meaning that both growing climate philanthropy and maximizing the real-world impact of every dollar are critically needed.[1]

At Giving Green, we guide impactful climate giving. Our researchers evaluate and recommend organizations addressing climate change, searching for those with evidence-backed strategies, an eye towards global impact, and a compelling use for further funding.[2] We aim for our Top Nonprofits to balance the inclusion of a diversity of tactics while being simple and actionable, and we are committed to using a scientific, transparent approach to help donors maximize their contribution to climate solutions. Through our work, we hope to help donors big and small make a meaningful difference in climate action.

We drew our early inspiration from the global health and development space. In global health, the randomized controlled trial (RCT) revolution of the last two decades has led to the identification of effective and scalable interventions that improve well-being, often with a quantifiable impact per dollar. We set out to do the same, beginning with the question: what are the most cost-effective ways to avert GHG emissions? At face value, this type of evaluation framework may seem to lend itself to offsetting projects on the voluntary carbon market, which promise near-term, measurable GHG reductions—this is where we began our research. Yet our findings repeatedly pointed to the same result: even the most reliable offset projects paled in effectiveness compared to other types of interventions, such as policy advocacy.[3]

Our team has spent five years evaluating climate mitigation strategies for their potential to influence GHG reductions. This experience has led us to believe that 'systems change interventions' are the best bet for maximizing impact on climate. Loosely, we think of systems change strategies as those that "change the rules of the game." In other words, funding systems change means funding work that ultimately changes incentives and actions beyond the project being funded.[4]

[1] Climateworks, 2023
[2] We focus specifically on reducing greenhouse gas emissions and/or radiative forcing. For more on how and why we use this proxy, see Giving Green's Research Process (Giving Green, 2024)
[3] We tell this story in greater detail in Alliance Magazine (Stein, 2023).
[4] We see this as a descriptor rather than a definitive definition, though we think it is in line with other definitions of systems change. Systems Change Lab defines a system as "an interdependent set of elements that are connected through a web of relationships. These elements can include living organisms (e.g., plants, animals and fungi) and physical entities (e.g., buildings, rocks and water), as well as immaterial social, political, economic and cultural institutions. Together, these components interact to produce a whole that is greater than the sum of its parts like a forest or a city." Systems researcher Donella Meadows defines a system as: "A system is a set of things—people, cells, molecules, or whatever—interconnected in such a way that they produce their own pattern of behavior over time." (Thinking in Systems, p.2)

Examples of systems change strategies include, but are not limited to:

- Policy advocacy, which can shape the rules under which other actors play.
- Technology development, which can change the options available to other actors to implement climate solutions.
- Market shaping, which can decrease costs and increase incentives for actors to implement climate solutions.
- Strategic grassroots organizing or community-driven projects, which can build political will and serve as scalable blueprints that make it easier for other actors to pursue similar projects.

We observe that there is a spectrum, rather than a binary, when differentiating systems-change strategies from non-systems-change strategies.[5]

The interventions we lay out above all aim to affect a broad range of actors in the present and future, but at early stages, the results, and the magnitude of these results, are inherently uncertain. On the other hand, non-systems-change interventions are often characterized by higher certainty and relative ease in measuring impact. Carbon offsets—quantifiable emissions reduction or avoidance projects with clear boundaries—are examples of what we consider to be non-systems-change projects and tend to be largely funded through the voluntary carbon market. Funding systems change work is a critical role of climate philanthropy, addressing a gap that markets alone cannot fill.

This report aims to explain what Giving Green means by systems change and why we believe it represents the best opportunity for climate donors. We first outline two key examples of the development of climate technology and policy, which motivate us to prioritize certain types of interventions and indicate how we might do so. We then explain how our research process captures the impact of these interventions. Finally, we describe considerations for funders interested in funding systems change work.

The path to systems change: Two guiding examples from the history of climate action

Understanding the factors influencing past technological and political successes in climate has enabled us to better evaluate today's systems interventions. In particular, it has allowed us to identify patterns of key interventions as well as important features such as chronologies and timescales. Observing common characteristics across these interventions has enabled us to appropriately contextualize our framework to ensure that our metrics can adequately capture, weigh, and, to some extent, measure the impact of these types of interventions. We present two illustrative examples below: the scale-up of solar photovoltaic (PV) globally and the passage of the Inflation Reduction Act (IRA) in the US.

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[5] We think that viewing systems change as a gradient rather than a binary is supported by other work in systems. For instance, see Donella Meadows' list of leverage points, or places to intervene in a system.

Scaling solar photovoltaic

One of the major barriers to scaling emerging technologies is cost, and solar PV is one of the most widely cited examples of successful cost reduction. **Figure 1** illustrates the price trajectory of solar PV, dropping from over $100 per watt to less than $0.5 per watt.

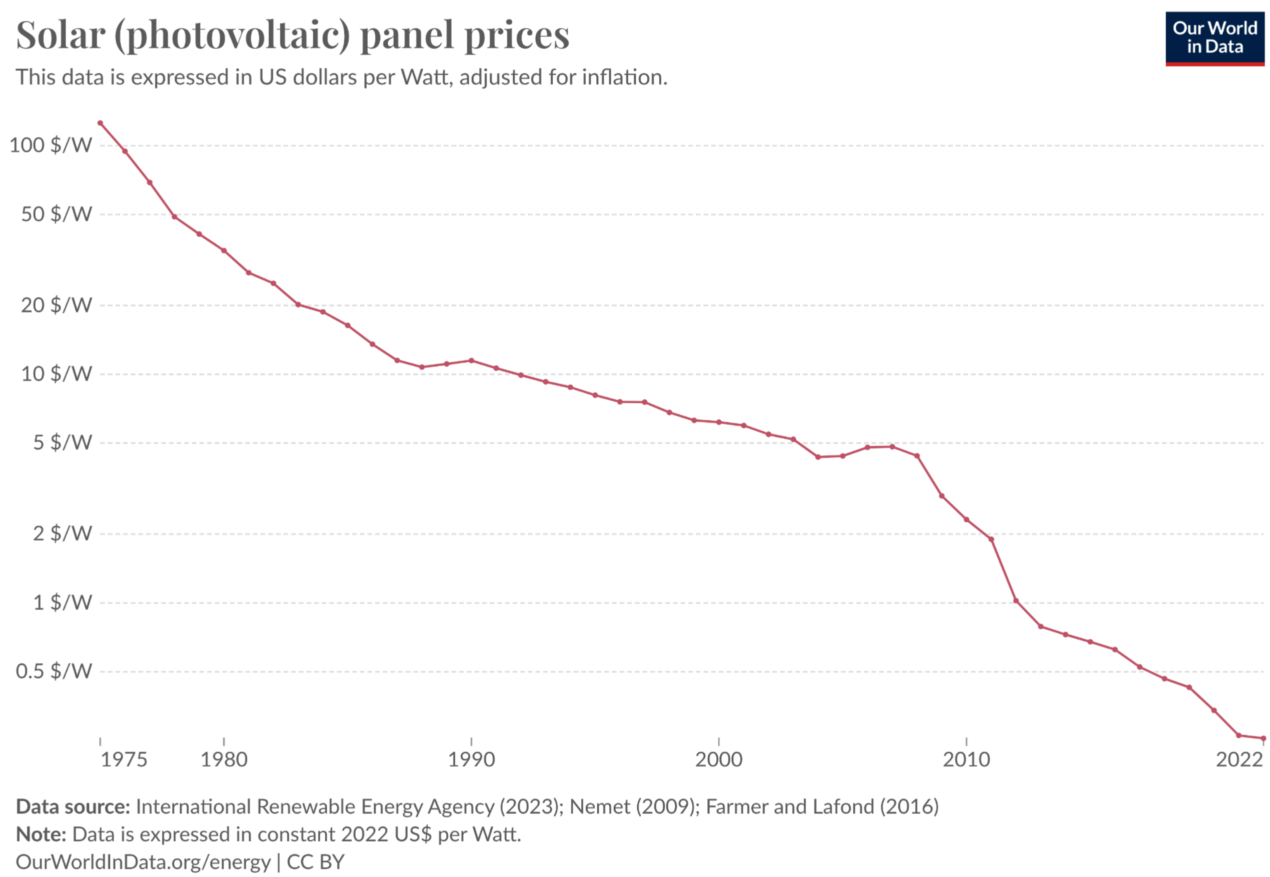

Figure 1: Decline in solar PV panel prices since 1975 (Our World in Data).

Solar PV serves as a case study from which we can learn what works to drive down the costs of new green technology. Below, **Table 1** summarizes notable events in the development of solar PV, as described in the book *How Solar Became Cheap: A Model for Low-Carbon Innovation.* We categorize each event by a broad "intervention"—the generalizable strategy we identify as having supported cost reduction.

Table 1: Notable countries, interventions, and events leading to cost reduction in solar PV[6]

Years	Intervention	Notable events	Country
Pre-1950s	n/a	Einstein published a paper explaining the photoelectric effect in 1905.	N/A
1950s	Private RD&D	Bell Labs, the research arm of the Bell Telephone Company, announced the first efficient solar cell in 1954.	US
1970s to 1980s	**Government RD&D**	Project Independence, an effort to develop domestic energy sources in response to the OAPEC oil embargo, was unveiled in 1973.	US
	Demand-pull policy	US Energy Block Buy, a five-stage public procurement program that committed to purchasing predetermined amounts of PV annually, was active from 1975 to 1986.	US
	Government RD&D	The Sunshine Project, a national R&D project for new energy technologies, was implemented from 1974 to 1984.	Japan
	Niche markets	Niche markets such as satellites, lighthouses, watches, and calculators sustained solar PV when prices were too high for mass markets.	Japan
1990s	*Demand-pull policy*	The Rooftop Subsidy Program, which included rebates, simplified permitting, and net metering, was initiated in 1994.	Japan
	Workforce development	Entrepreneurs were trained in Australia and would later build gigawatt-scale PV factories in China.	Australia
2000s to present	*Demand-pull policy*	Germany launched its feed-in tariff in 2000 to promote renewable energy sources; this policy substantially grew the market for solar PV.	Germany
	Manufacturing scale-up	In 2005, Suntech became the first Chinese company to launch an Initial Public Offering, marking the beginning of Chinese firms' prominence in PV manufacturing.	China
	Demand-pull policy	To balance a supply surplus and insufficient international demand, China launched its feed-in tariff in 2011 to promote domestic adoption of solar PV.	China

We observe that the predominant interventions, across decades and countries, are **government support of RD&D (research, development, and demonstration)** and *demand-pull policies* (in blue/bold and

[6] *How Solar Became Cheap: A Model for Low-Carbon Innovation,* Nemet, 2019

green/italics, respectively).[7] Similarly, a 2018 study finds that from 2005 to 2012, public R&D and market-stimulating policies were key drivers in catalyzing "high-level mechanisms of cost reduction", such as economies of scale (EOS), learning by doing (LBD), and private research and development (R&D) (**Figure 2**).

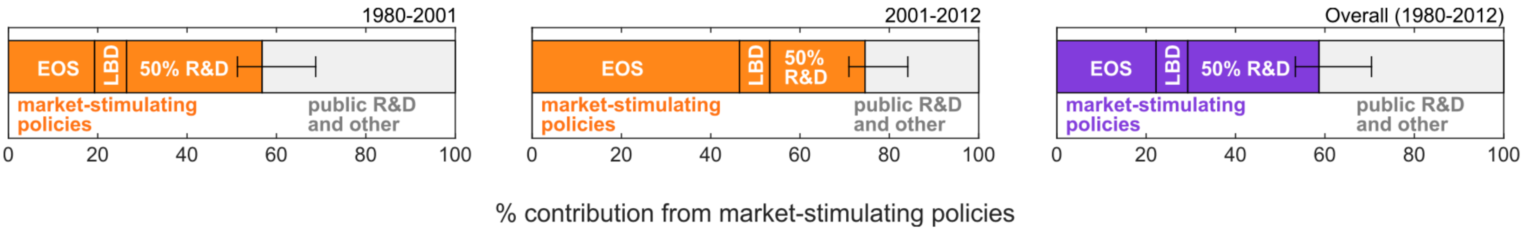

Figure 2: Contribution of market-stimulating policies to module cost reduction[8]

Key learnings

To accelerate the green transition, we must quickly replicate the success of PV—rapidly reducing costs and scaling up production—to new green technologies like advanced geothermal, green hydrogen, and alternative proteins. How can lessons from solar PV's history guide philanthropy in supporting today's emerging technologies with the potential for systems change? We suggest that funders must be prepared to fund and assess:

1. **Government-backed RD&D:** Government-funded research, development, and demonstration (RD&D) is an important form of public policy that, in certain contexts, is a necessary precursor and even contemporary to market-shaping initiatives. *A priori*, RD&D outcomes are highly uncertain, and technical feasibility is difficult to ascertain at early stages. However, as evidenced by the example of solar PV, the scale of impact can be very large.

2. **Policy advocacy with uncertain outcomes:** Similar to RD&D, at early stages, the scale of impact that demand-pull and other policies will reach is highly uncertain. We view advocacy for such policies as high risk but high reward. Unlike RD&D, the uncertainties are often less technical and instead stem from the influence of political, social, and market factors. However, evidence such as the history of solar PV suggests that public policy is a critical lever to reducing costs and ultimately scaling technologies.

3. **Strategic local proof-of-concepts:** National and even international policies are often preceded by and catalyzed through local policy or community-led initiatives. For example, the German feed-in tariff, a demand-pull policy to support renewable energy, was heavily influenced and shaped by existing policies, including (i) a California policy from the 1980s and (ii) model policies developed in

[7] We use demand-pull, market-stimulating, and market-shaping policies interchangeably. They serve as umbrella terms to mean strategies that stimluate market demand for emerging technologies, and we acknowledge that these policies can look different depending on technological and political context. Examples include feed-in tariffs and renewable portfolio standards.
[8] *Evaluating the causes of cost reduction in photovoltaic modules*, Kavlak, McNerney, and Trancik, 2018

German cities in the 1990s, the first of which was an activist-driven law in the municipality of Aachen.[9] Because of this, there are instances in which we may attribute high potential scale to localized policies or efforts if we identify them as replicable and scalable blueprints or strategic levers to unlock social awareness or acceptance and increase political viability.

Not all technologies are comparable, and we recognize that the trajectory of solar PV was also influenced by certain intrinsic and extrinsic drivers, such as modularity and knowledge spillovers. In our research, we aim to individually consider each technology's potential to scale and to be transparent regarding the limitations and uncertainties of comparatives.

Passing the Inflation Reduction Act

As referenced, we view nonprofits' advocacy for clean energy provisions in the IRA as another example of a powerful systems change lever—work for which success was far from guaranteed, but the potential scale of impact was massive. If and as they are implemented, the IRA's climate provisions will shift incentives for actors at all scales towards choices that reduce emissions, through tools ranging from subsidies for home electrification to new federal investments in RD&D to green technologies that can be commercialized worldwide.

We closely evaluated the US federal policy landscape in the years leading up to the passage of the IRA, and we broadly observed that the IRA required three conditions to pass, each of which was brought about by systems change strategies:

1. Legislators needed a strong incentive to act on climate. This was created by a set of activities that we grouped under the strategy "outsider advocacy," most notably by the Sunrise Movement, a previous Giving Green recommendation. Outsider advocacy includes tactics such as:
    a. Narrative-building to create a culture shift towards climate as a top issue for US voters.
    b. Applying pressure on politicians through protests, media coverage, and, ultimately, influence over the electorate.
2. Legislators needed the resources to propose strong climate legislation. This was provided by what we term "insider advocacy," such as that done by past and present Giving Green recommendations like Evergreen Collaborative and Clean Air Task Force. This strategy includes tactics such as:
    a. Publishing research reports that support the case for climate action and/or form the basis of proposed legislation.
    b. Developing model legislation and executive actions.
    c. Building relationships and coalitions across government bodies to share knowledge, coordinate efforts, and build influence.

[9] *How Solar Became Cheap: A Model for Low-Carbon Innovation*, Nemet (2019), page 111

3. A pro-climate coalition was needed in office. In the US, this realistically means a Democratic trifecta: holding the presidency and a majority in the House and Senate.[10]

Key learnings

Civil society was integral in moving climate to the top of the political agenda, enabling the passage of the IRA. To cement and expand these wins, we need a powerful and global climate movement. How can funders identify and support the organizations that are effectively building this movement? In our view, systems funders practice:

1. **A high tolerance for uncertainty:** As previously discussed with respect to solar PV, policy advocacy is high-risk but high-reward. The scale of the IRA's impact is still uncertain for various reasons, including (i) most of its climate measures are voluntary and require individuals, companies, and subnational governments to proactively navigate the incentive structures and (ii) it is likely that a Republican-controlled government in the US will aim to undo some or all of the IRA's climate provisions.[11] Supporting systems change requires a tolerance for uncertainty, a strategy to prioritize under uncertainty, and an openness to funding work that may not yield significant measurable emissions reductions for years or decades.

2. **Context-specific assessment of the political terrain:** Systems change requires tactics that are feasible under the system's current conditions. Therefore, we cannot identify effective tactics outside of their context. For example, narrative-building is a tactic heavily used by many organizations throughout the climate movement in the 2000s and 2010s, but none succeeded in creating the same systemic culture shift as the Sunrise Movement did, in part because the political environment shifted.[12] As another example, we find that policy work like that described above is not currently feasible in the US due to the absence of a pro-climate coalition in elected office. Thus, endorsing systems change strategies does not mean uncritically endorsing advocacy work, but it does mean that identifying such windows of opportunity can be highly impactful for philanthropy.

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[10] Funding electoral work, while it can lead to systems change, is outside the scope of Giving Green's research as a project of a 501(c)(3) nonprofit; however, we take into account likely electoral outcomes when evaluating the feasibility of non-electoral strategies.

[11] "even a partial IRA repeal combined with weakened EPA regulations could significantly harm odds of meeting the current administration's goal of slashing emissions in half by 2030", Holzman 2024; "A victory for Donald Trump in November's presidential election could lead to an additional 4bn tonnes of US emissions by 2030 compared with Joe Biden's plans, Carbon Brief analysis reveals… This includes the Inflation Reduction Act – which Trump has pledged to reverse – along with several other policies", Evans and Viisainen, 2024

[12] For analysis of the climate movement pre-2017, see McAdam, 2017: "The prevailing consensus among movement scholars is that the prospect for movement emergence is facilitated by the confluence of three factors: the expansion of political opportunities, the availability of mobilizing structures, and cognitive and affective mobilization through framing processes. The author then applies each of these factors to the case of climate change, arguing that (a) awareness of the issue developed during an especially inopportune period in American politics, (b) the organizations that arose to address the issue were ill suited to the kind of grassroots mobilization characteristic of successful movements, and (c) the amorphous nature of the issue played havoc with efforts at strategic framing."

Our methods and findings: Contextualizing systems change interventions in our research framework

The Shifting Systems Initiative, a multi-year effort led by major philanthropies, notes that traditional evaluation methods in philanthropy focus on short-term outcomes, quantitative data, and linear theories of change; these methods are not naturally well-suited for evaluating systems change work like the interventions above.[13] Therefore, over the five years of our research, we have grown our evaluation toolkit from one focused squarely on near-term direct emissions reductions to one encompassing a broader range of impact strategies. Below, we show how our research framework allows us to evaluate systems change work. We then explain how we concluded that for each philanthropic dollar spent, systems change work can be at least an order of magnitude more impactful than the direct reduction work favored by traditional evaluation approaches.

Qualitative framework

Giving Green's research process consists of five main steps:[14]

1. Identify impact strategies.
2. Assess impact strategies.
3. Longlist potential organizations.
4. Evaluate specific funding opportunities.
5. Publish recommendations.

In steps 2 and 4, we assess the impact of strategies and nonprofits' interventions on the basis of three qualitative criteria: scale, feasibility, and funding need. Through scale, we attempt to determine either how much a sector contributes to climate change or how much a particular strategy or intervention could reduce climate impacts. Through feasibility, we attempt to determine the likelihood of a strategy or intervention reaching the aforementioned scale. Through funding need, we analyze philanthropic, private, and public sector funding and identify any gaps that climate philanthropy is well-positioned to fill. A more detailed description of these metrics can be found in Giving Green's Research Process.

Given the complex nature of climate interventions, there are many different ways to think about and measure potential impact. We adapted scale, feasibility, and funding need from the importance, tractability, neglectedness framework used in effective altruism, which does not *a priori* distinguish systems change interventions from direct interventions.[15]

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[13] "While popular notions of social impact evaluation tend to assume discrete projects and relatively straightforward theories of change, systems change assessment requires a more holistic view…" Grady et al, 2020

[14] We often present our process as linear, given that for a typical research cycle (January-November), we generally follow the steps chronologically. However, over the course of multiple research cycles, the evolution of the process is more entropic and iterative.

[15] While the framework was initially developed to guide giving in US policy areas, it is now applied to a broad variety of interventions. It is possible that the framework may still underrate systems change interventions: see discussion in Oehlson (2024) of its application at Open Philanthropy, in particular p.77.

We think that this framework is broad enough to capture systems impacts, general enough to be applied across diverse interventions, and rigorous enough to allow others to critically examine our research and conclusions. Guiding examples like the development of solar PV and the passage of the IRA teach us that any evaluation framework that does not account for certain key features would be an incomplete measure of systems change impact. However, we have found that often it is precisely these key features that are difficult to measure and don't lend themselves to standard metrics and quantification frameworks. Examples of these key features include:

- **High uncertainty:** We describe our approach as cautiously optimistic: most of the strategies we prioritize can be described as high risk, high reward.[16] Reaching a high scale of impact depends on factors that are difficult to measure or predict, including political will, knowledge spillover, and social license to operate. Given the difficulty in measuring the impact of such strategies, we often use relevant examples of other technologies or policies to help us evaluate scale and feasibility.
    - *Example*: We generally prioritize efforts to advocate for strong energy sector policies over direct funding for localized renewable energy projects. We may have higher certainty in determining the link between funding and impact for a specific solar farm project. However, its scale would be substantially lower than that of advocacy for policies like IRA, which can effect profound societal, technological, and market shifts, and result in many more gigawatts of solar capacity being installed.

- **Sensitivity with respect to timescale:** Scale and feasibility evaluations vary greatly depending on the target year, e.g., 2030 vs. 2050; we generally use a 2100 timeline.[17] In practice, we do this by combining nearer-term quantitative estimates, such as IPCC projections, with longer-term qualitative assessments. By allowing for longer-term considerations, we ensure that we are including catalytic strategies in our prioritization.
    - *Example*: While solar and wind are currently more feasible and will reach a higher scale by 2030 than other clean energy sources, we have prioritized nascent clean, firm energy technologies such as next-generation geothermal and advanced nuclear energy technologies as we consider them to be critical components of mid-century energy portfolios.

[16] High risk and high reward are used here in a relative sense. We believe these strategies are higher-risk and higher-reward than what carbon markets or traditional philanthropic evaluation approaches allow; in comparison to these, we do have a considerable tolerance for risk, given that while transformative change is inherently difficult to predict and measure, it is fundamental for an issue as complex and multi-faceted as climate change. However, we do not elevate strategies for which we think the likelihood of success is too low, especially when the level of uncertainty is high across critical parameters; we tend not to make "all-or-nothing" bets that hinge on low-probability outcomes.

[17] "We think the future of climate change is difficult to predict, and it is our general impression that there is fairly large disagreement and uncertainty over a wide range of future climate scenarios. We use a 2100 timeline to very roughly balance two broad scenarios: (1) mitigation efforts are relatively successful, and suffering due to climate change is concentrated through 2100; (2) mitigation efforts are relatively unsuccessful, and suffering due to climate change increases over time, including beyond 2100. We are highly uncertain about the future of climate change, but broadly think scenario 1 is more likely and would cause less suffering than scenario 2." Giving Green, 2024

- **Broad and/or not well-defined boundaries:** When we decide how to include and frame an impact area within our research dashboard, we are inherently drawing boundaries. However, we recognize that there is unavoidable overlap, interconnectedness, and feedback between impact areas and the interventions within and across impact areas. This becomes particularly critical when we evaluate scale, feasibility, and funding need, and we have to impose some delineation to make our process tractable.
    - *Example*: Our research found that one of the most promising philanthropic strategies to address climate change from within Australia is decarbonizing Australia's industry exports. Decarbonizing heavy industry will require a shift to clean energy sources, so highly effective interventions include advocacy work for building out Australia's large renewable energy potential. Even though we list decarbonizing heavy industry and renewable energy deployment separately in our research dashboard, we recognize that the evaluations of each are inextricably linked.

Certain philanthropic approaches may address these challenges by narrowing the scope of evaluation to only include what is more certain, nearer-term, and well-defined. In climate, this might look like prioritizing projects that can point to a concrete number of trees planted or solar panels installed over projects whose impact comes from contributing to policies that reduce the incentives for deforestation across entire countries or scaling nascent clean energy technologies. By contrast, we think that, when fairly considered under our framework, systems change interventions should and do tend to outrank other interventions, primarily because **the scale of a systems change intervention tends to be many orders of magnitude higher than a direct intervention.**

In practice, to evaluate scale, feasibility, and funding need with rigor given the above characteristics, we construct a theory of change for an intervention or organization. An example of a theory of change for a complicated systems-change intervention, which has uncertain effects across long time periods on many different actors, is below in **Figure 3**. Explicitly assessing the chain of events that leads to impact, and the assumptions required for these events to occur, ensures we are able to meaningfully evaluate interventions and adequately account for context (e.g., specific technologies or political actors, as discussed in the Key learnings sections of "Guiding examples").

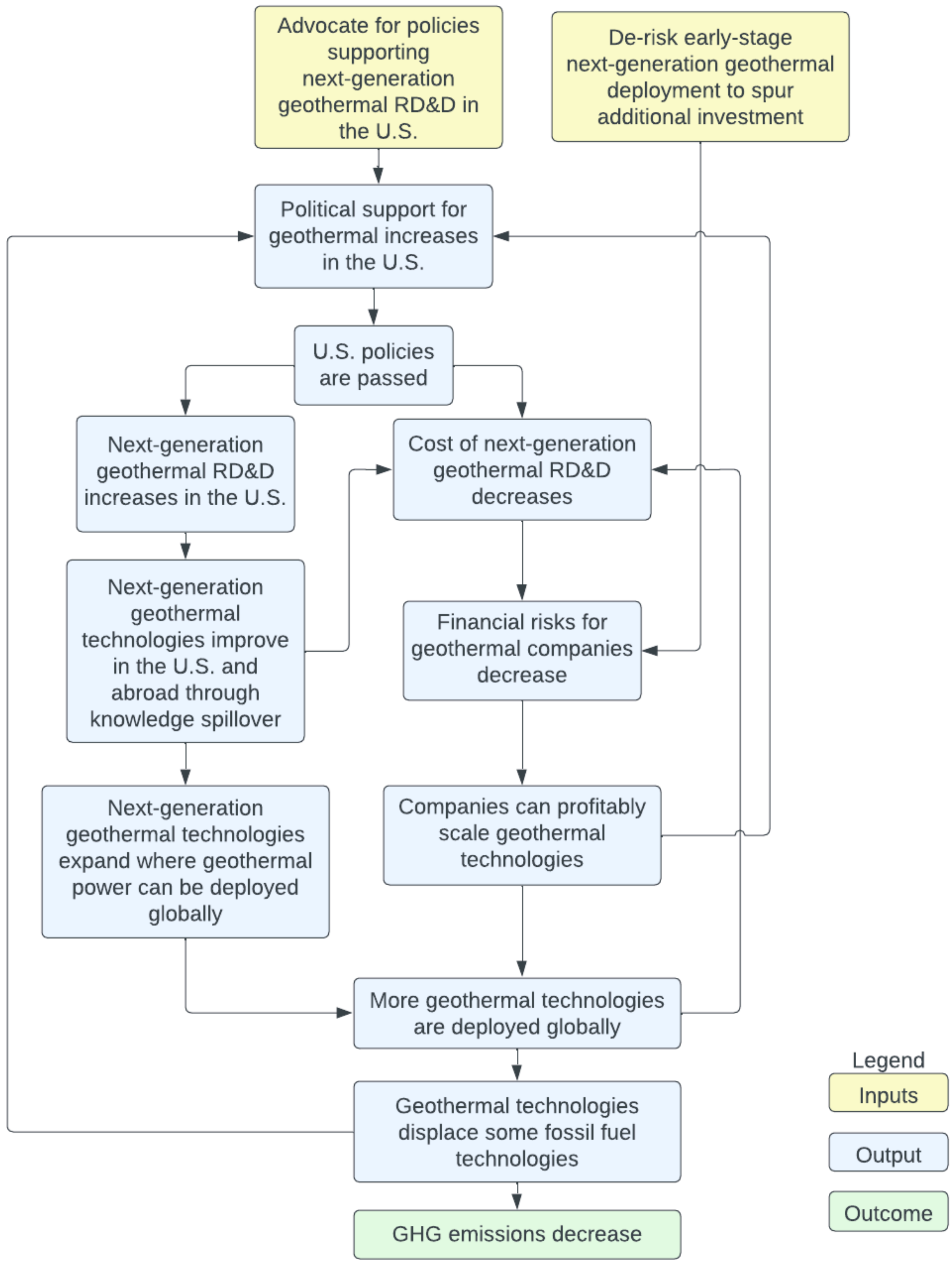

Figure 3: Giving Green's theory of change for philanthropic support for next-generation geothermal technologies[18]

[18] *Geothermal Energy*, [Giving Green, 2023]

Quantitative cost-effectiveness analysis

In certain contexts, we try to estimate cost-effectiveness as an input into our evaluation, giving us a quantified threshold to complement our qualitative analysis. Given the high uncertainty and subjectivity inherent in many key parameters of our cost-effectiveness analyses, we do not take these results literally; we consider them as rough plausibility checks rather than precise metrics.

In this process, we need to estimate many inherently uncertain inputs: for example, cumulative emissions reductions that may result from a policy, or the influence of one organization within an ecosystem of advocates for that policy. We often base these estimates on existing modeling or on interviews with key stakeholders such as policymakers. We stress that we generally calculate *expected value*; the "real" outcome, if measured in hindsight, may and likely will be different.[19] Relying on expected value is how we grapple with uncertainty while ensuring we are rigorously evaluating the possible conditions under which an organization might have high impact.

Table 2 lists some of our past cost-effectiveness analyses. We note that these numbers are highly uncertain—we believe all of our Top Nonprofits are roughly equally impactful in expectation.

Table 2: Selected Giving Green CEA results

	Cost-effectiveness ($/t$CO_2$e)	
Organization and/or intervention analyzed	Realistic	Range
Future Cleantech Architects: policy engagement with the EU's Renewable Energy Directive (CEA (2024), research (2024))	$0.14	$0.01 to $33
Industrious Labs: campaign for corporate commitments on green aluminum (CEA (2022), research (2024))	$0.52	$0.03 to $12.30
Evergreen Collaborative: development of green policies that informed the IRA (CEA (2021), research (2022))	$0.54	$0.18 to $1.08
Opportunity Green: advocacy for regulations to decarbonize international shipping (CEA (2024), research (2024))	$0.76	$0.03 to $7.72
Good Food Institute: increasing funding for alternative protein research (CEA (2024), research (2024))	$2.98	$0.68 to $192.23
Geothermal energy: nonprofits' US policy advocacy and de-risking efforts (CEA (2024), research (2024))	$2.75	$1.08 to $43.17

[19] Giving What We Can (Steinberg, 2022) provides an accessible explanation of expected value and its applications in donating to charity under conditions of uncertainty.

Our estimates of the cost-effectiveness of research and advocacy work are on the order of magnitude of $1/t$CO_2$e. This is about an order of magnitude more cost-effective than a credible carbon credit. The cost of credits in major carbon markets tends to be in the $10 to $1000 range.[20] The cost-per-ton of other credible carbon credits we have evaluated ranges from $18 (Tradewater's refrigerant destruction offsets) to hundreds of dollars (e.g. Charm Industrial's carbon sequestration).

We recognize the substantial variation within nonprofit-driven approaches and within carbon credits, and that some credit-supported programs do involve elements of systems change. On the whole, though, we think that the general trend of systems change work outperforming direct emissions reductions is clear. We think that the order of magnitude of $1/t$CO_2$e is a reasonable threshold to strive for when selecting systems change strategies to fund, and we use this as a quantitative benchmark for the most promising systems change giving opportunities. This demonstrates the impact that can be achieved when there is tolerance for substantial amounts of uncertainty.

We note that marginal impact evaluation, cost-effectiveness analysis, and counterfactual reasoning are fundamental tools meant to isolate the impact of some individual component of a system. As systems themselves are defined by interconnections and emergent behavior, these tools have been criticized for failing to account for the possibilities of collective action, the distribution of measured impacts across an inequitable society, the impacts of nonlinear feedback loops, and so on.[21] Because of this, we again underline that our cost-effectiveness analyses are not definitive measurements.

Conclusion: Two central learnings for systems funders

Our research has revealed certain characteristics of the systems change projects needed to address many drivers of climate change, and the tools we think climate funders can use to identify and evaluate this work.

Although we acknowledge that no canonical method or process ensures a systems change outcome, we propose two central considerations that we have found helpful in our evolution toward increasing the impact of our work.

1. **Embrace uncertainty and consider secondary effects** across variable timescales and within broad and/or not-well-defined system boundaries. This may require adjusting a research process or framework, expanding or modifying the set of associated metrics, and understanding the benefits and limitations of both qualitative and quantitative approaches. A strategy with higher uncertainty that is less conducive to quantitative measurements is not inherently less rigorous. In fact, the emphasis on higher certainty and measurability, while necessary in certain contexts such as credit-based transactions, can actually limit impact.

[20] EU-ETS: 50 to 100 euros per ton in 2022-2024 (statista, accessed 2024). Voluntary carbon market average: $6.50 per ton in 2023 (Forest Trends, 2024). These costs do not account for credibility issues with the voluntary carbon market which result in a true cost-per-ton that is much higher than the sale price; high-quality offsets like those we evaluated tend to be more expensive.
[21] For example, see criticism of our process here.

2. When considering what to fund, **contextualize strategies, initiatives, and projects under a theory of change that demonstrates a path to broader impact** and outlines how each actor interacts with the wider system at distinct points in time. Effective construction and interpretation of this theory of change benefit from analysis of the likelihood of causality and links.

Philanthropy is uniquely well-positioned to fund systems change as it can take a relatively unconstrained, global, and holistic inventory of progress and dynamically fill gaps left by other sectors. In doing so, it also has the opportunity to systematically experiment with objective, evidenced-based strategies in the pursuit of maximizing impact. We believe that these high-impact strategies are integral when considering a comprehensive approach to tackling climate change. We hope that climate funders can lead the way in elevating them, defining them, and even measuring them so as to promote their inclusion in climate strategies across sectors.[22]

We will continue to iterate, evolve, and improve our process over time and remain devoted to high levels of transparency regarding our work, including our methodology, decisions, and even mistakes. We encourage increased levels of transparency across philanthropy so that we can advance the philanthropic field, positively influence the broader ecosystem of climate funding and finance, and maximize our collective impact on the climate crisis.

[22] For example, private sector climate strategies generally reflect low tolerance for risk and often prioritize lower cost over higher quality when directing purchases or investments. This is, in part, a reflection of the nature of conventional frameworks and guidance, which emphasize ton-for-ton accounting over maximizing longer-term impact. For more discussion, see our report on *How to Think Beyond Net Zero.*