Implementing the Greenhouse Gas Reduction Fund: Investment needs, barriers, and opportunities

Interim Report

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CLIMATE
POLICY
INITIATIVE

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ABOUT CLIMATE POLICY INITIATIVE

Climate Policy Initiative (CPI) is an analysis and advisory organization with deep expertise in finance and policy. Our mission is to help governments, businesses, and financial institutions drive economic growth while addressing climate change. CPI has six offices around the world in Brazil, India, Indonesia, the U.K., and the U.S.

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1. INTRODUCTION

In 2021 and 2022, the U.S. Congress passed three bills that, together, represent an historic investment in the country's climate resilience and equitable economic development:

- the Infrastructure Investment and Jobs Act (IIJA),
- the CHIPS and Science Act of 2022, and
- the Inflation Reduction Act of 2022.

The Inflation Reduction Act's Greenhouse Gas Reduction Fund (GGRF), managed by the U.S. Environmental Protection Agency (EPA) will provide $27 billion in grants to state, local, and tribal governments as well as not-for-profit financial institutions to mobilize financing for projects that reduce greenhouse gas (GHG) emissions, particularly where the benefits of such projects flow to low-income and disadvantaged communities (LIDCs).

LIDCs, especially communities of color, are disproportionately vulnerable to the impacts of climate change related shocks, including heat waves, flooding, and poor air quality.[1] Communities of color are more likely to experience pre-existing and chronic stresses like poor health and living conditions than their white counterparts.[2] Redlining and other discriminatory housing policies have led to concentration of low-income communities in areas more likely to experience extreme heat.[3] Low-income communities also have a higher energy burden, spending 8% of their income on energy compared to 2.3% for higher-income households, nationally.[4]

These climate-related shocks and stresses are further exacerbated by existing burdens in LIDCs that are historical, natural, and human induced, especially as populations in these communities grow. Climate funding without a strategy that considers income, geographic, and racial disparities is likely to replicate or even increase wealth and prosperity gaps, and to be less effective in reducing emissions. The historic funding

[1] EPA (2021) https://www.epa.gov/cira/social-vulnerability-report
[2] American Public Health Association (2018), https://www.apha.org/-/media/files/pdf/topics/climate/climate_health_equity.ashx
[3] https://rmi.org/investing-in-healthier-low-income-housing/
[4] American Council for an Energy-Efficient Economy (2020) https://www.aceee.org/sites/default/files/pdfs/u2006.pdf

opportunities put forward by the Inflation Reduction Act, Infrastructure Investment and Jobs Act (IIJA), including the GGRF and the Justice40 Initiative,[5] stand to be the largest investment to date for climate and environmental justice programs and transitions for LIDCs. These investments have the opportunity to kickstart equitable policies and practices and provide an opportunity to redress inequities, build capacity, enhance the wealth and financial security of low income communities as part of climate resilience efforts, invest in efforts responding to community needs and protect investments in emissions reduction from becoming another vehicle for disenfranchisement.[6]

In support of these aims, the GGRF will disburse $27 billion through three competitions, as show in the table below.[7]

Title	Total prize fund	Due date	Mandate
Solar for All	$7 bn	September 26, 2023	To award up to 60 grants to states, territories, tribal governments, municipalities, and eligible nonprofit recipients to expand the number of LIDCs primed for distributed solar investment. This aims to enable millions of low-income households to access affordable, resilient, and clean solar energy. Grantees will use funds to expand existing low-income solar programs or design and deploy new Solar for All programs nationwide
Clean Communities Investment Accelerator (CCIA)	$6 bn	October 12, 2023	To provide grants to 2–7 hub nonprofits that will in turn provide funding and TA to specific industry networks of public, quasi-public, not-for-profit organizations, and nonprofit community lenders, supporting the goal for every community in the U.S. to have access to the capital they need to deploy clean technology projects in homes, small businesses, schools, and community institutions.
National Clean Investment Fund (NCIF)	$14 bn	October 12, 2023	To provide grants to 2–3 national nonprofit financing entities to create national clean financing institutions capable of partnering with the private sector to provide accessible, affordable financing for tens of thousands of clean technology projects nationwide.

[5] https://www.whitehouse.gov/omb/briefing-room/2022/05/23/delivering-historic-and-long-overdue-investments-in-disadvantaged-communities/

[6] https://www.brookings.edu/articles/the-case-for-climate-reparations-in-the-united-states/

[7] https://www.epa.gov/greenhouse-gas-reduction-fund/about-greenhouse-gas-reduction-fund, text is quoted from the Notice of Funding Opportunities for each competition.

Title	Total prize fund	Due date	Mandate
			These national nonprofits will provide financing to individuals and families, nonprofit organizations, for-profit businesses (especially small ones), government entities, and others deploying these projects, with the aim of reducing pollution while creating jobs, accelerating progress toward energy security, and lowering energy costs. These national nonprofits will also provide capital to community lenders and other similar institutions so that they can, in turn, provide financing to the communities that they serve.

1.1 OVERVIEW OF PROJECT

To achieve the intended dual goals of the GGRF – to reduce emissions and to benefit low income and disadvantaged communities – the EPA, GGRF applicants, and the ultimate competition winners will need data, analysis, and best practice models to refine their strategies and implement the public resources effectively. Successful implementation will require actors from across the ecosystem of green and community finance to share knowledge and resources on what is working and what more needs to be done.[8]

CPI is undertaking this knowledge project to provide baseline data and neutral analysis to inform effective applications for, and subsequent deployment of, GGRF funds. It focuses on the investment needs and barriers to investment in LIDCs, as well as the technical assistance (TA) and financing structures that can overcome these barriers, regardless of the implementing coalitions ultimately selected by the Environmental Protection Agency (EPA).

The project comprises two parts:

1) **An Interim Report** (this document, and an associated data spreadsheet), which aims to support applicants to the three GGRF competitions with data and analysis. It includes the following:

[8] https://carsey.unh.edu/center-for-impact-finance/current-projects/greening-community-development-finance

   a. Initial analysis of investment needs in LIDCs down to the census tract level for the three priority project categories specified in the GGRF (distributed energy generation and storage, net-zero emissions buildings, and zero emissions transportation).
   b. An analysis of how those needs compare to existing climate finance flows in the U.S. and barriers to filling the gap between needs and flows; and An initial review of opportunities for technical assistance and other sources of financing to address the barriers and facilitate effective GGRF implementation.

2) **A Full Report** (to be completed in late 2023), which aims to support the effective **implementation** of GGRF funds, regardless of which organizations ultimately receive GGRF funds. Building and expanding on the interim report, the full report will additionally address the following research topics:
   a. What are effective and needed practices for TA and training, including support to the recipient organizations, development services provided to recipient borrowers and grantees, workforce development, and broader market system support?
   b. What kinds of tools, processes or specialized investment and grant products are being, or could be, used to overcome the identified barriers to investment?
   c. What are the potential funding and financing structures that could leverage GGRF funds to mobilize other funding sources including and beyond traditional community development financial institution (CDFI) and green bank balance sheets and products to bring in mainstream banks, program and mission related investors, impact investors, and equity investors, as well as concessional capital and incentives from other government programs, guarantors, and philanthropies to deliver climate benefits as well as co-benefits such as health, economic development, equity, and broader climate resilience impact and value?

1.2 REPORT STRUCTURE

This Interim Report is structured as follows:

- **Section 2**: GGRF Climate Investment Needs: Description of the methodology, use cases, and results of the data analysis to support GGRF applicants.

- **Section 3**: Understanding current climate finance flows and barriers to investment: why are funds not flowing today?

- **Section 4**: Initial review of potential TA models and financing structures, with a focus on what foundations can do to fill in gaps before GGRF implementation begins.

1.3 NEXT STEPS AND REQUEST FOR FEEDBACK

As we progress towards the full report, CPI will seek to enhance both our estimates and presentation of investment needs as well as develop in more detail our analysis of TA and financing structures. We welcome your feedback on this report and dataset, and your views on what is essential to include in the full report.

2. GGRF CLIMATE INVESTMENT NEEDS

This section provides an overview of use cases for investment needs data, the source data set used for our analysis, initial results, and the detailed methodology for the investment needs data analysis. The section is intended to serve as a complement to a data file containing county-level estimates of investment needs, which is available on CPI's website at: Implementing the Greenhouse Gas Reduction Fund: Interim Report.

2.1 USING INVESTMENT NEEDS DATA

The Clean Communities Investment Accelerator and National Clean Investment Fund focus on three priority project categories of commercial technology: distributed energy generation and storage; net-zero emissions buildings; and zero-emissions transportation. To support potential GGRF intermediaries as well as the EPA and the U.S. climate finance ecosystem overall in effectively deploying GGRF funds, we have estimated the investment amounted needed in these three project categories, at the local level, in order for the U.S. to achieve net-zero GHG emissions by 2050.

This data analysis aims to support GGRF applicants and awardees to make the case for and allocate funding, both geographically and across project types. The data supplement to this report includes breakdowns of the estimated investment needs at the county level, to allow applicants to focus on the specific geographies in which they operate and determine the relative amounts of financing needed in the different GGRF priority project categories and project types.[9]

In order to facilitate the prioritization of financing to LIDCs, as envisioned by President Biden's Justice40 Initiative, we have also identified those census tracts that are LIDCs, according to GGRF definitions. These census tract-level estimates can be aggregated up to the county and state levels to facilitate planning.

[9] Applicants seeking Census tract-level data may reach out to us directly.

We see at least three specific use cases for the investment needs data:

1) Potential GGRF intermediaries may use the data to demonstrate that they have presence in and local knowledge of areas with high LIDC investment needs in GGRF project categories. For example, county-level estimates may show that a GGRF coalition's members have strong presence in counties with large LIDC investment needs, compared to wealthier counties with lower LIDC investment needs.

2) Second, potential GGRF intermediaries may use the estimates to develop a baseline for allocating any GGRF funding received across geographies and project types. In the data supplement to this report, a GGRF coalition (or single intermediary) might select only those counties in which its members are active, and only the GGRF project categories it wishes to finance. The data table will then display the total investment needed for those counties and project categories, and the shares of needs in each individual county-category may be used to allocate any GGRF funding received and to target cofinancing from potential partner institutions.

3) Finally, these data may also support the EPA and other federal, state, and local agencies in aligning other programs and funding to support the success of the GGRF.

2.1.1 SOURCE DATA SET

These estimates are based on data produced by the Princeton Net-Zero America (NZA) project, which is, to our knowledge, the most robust public model and data set estimating the technological requirements for a net-zero economy. While our methodology is described in detail in Section 2.3, it is important to understand upfront the nature of these NZA data and what they can – and can not – tell us about potential GGRF investments in LIDCs.

The NZA project, which was completed in October 2021, produced detailed state-level estimates of the quantities of different commercially viable technologies that need to be deployed in order for the nation as a whole to reach net-zero by 2050. This analysis incorporated the technical characteristics of the technologies, climatological and geological features of different U.S. regions, demand forecasts for goods and services

(such as energy, transportation, etc.), and price forecasts for the technologies needed to meet these demands. Accounting for these factors, the NZA project data represent the mix and timing of deployments that minimize the national net present value of the transition to net-zero by 2050.

The schedules of technology deployment produced by the NZA project therefore do not represent the "correct" way for the nation to achieve net-zero by 2050. The results of the NZA project are dependent on the assumptions and judgments made in performing the analysis,[10] and different assumptions would lead to different deployment schedules. New technologies and policies, such as the IRA, will also undoubtedly have significant effects on the optimal path to net-zero.

There are other important limitations to these results. First, the NZA model was intended to optimize the overall cost of transitioning to net-zero, and does not reflect priorities such as poverty reduction, job creation, or equity. Therefore, GGRF stakeholders will need to rely on their own understanding of community priorities and local-level impacts of different types of investments when interpreting our estimates.

Second, the NZA project does not cover all types of projects that are eligible for GGRF support. For example, rooftop photovoltaic (PV) panels are the only technology covered under the distributed energy generation and storage GGRF project category, so we have not (yet) estimated investment needs for energy storage. Additionally, our estimates for the net-zero emissions buildings project category include the equipment and installation costs of energy-efficient appliances (such as electric heat pumps), but they do not include projects such as insulation or the construction of new, zero-emissions affordable housing. In the coming weeks, we will work to expand the coverage of our estimates.

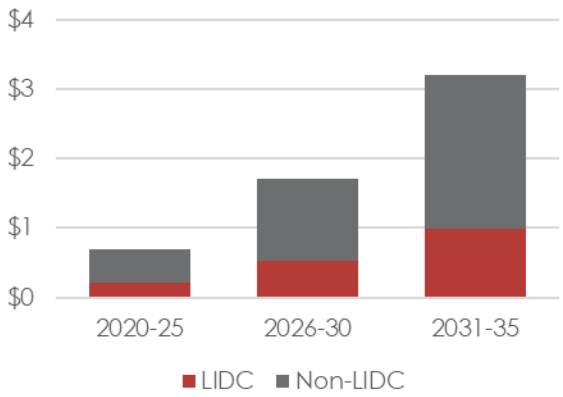
Finally, the NZA project only covers the continental U.S., so our estimates do not cover investment needs in Alaska, Hawaii, Puerto Rico, or the other U.S. territories. In addition, while census tracts include tribal lands, they do not share the same boundaries and therefore we cannot disaggregate tribal lands in our data. We are working on expanding our estimates to cover these geographies and tribal lands.

[10] In fact, the project itself produced five different "pathways" to net-zero, based on different policy and technology constraints; see section 2.3 below for more information.

2.2 OVERVIEW OF INITIAL RESULTS

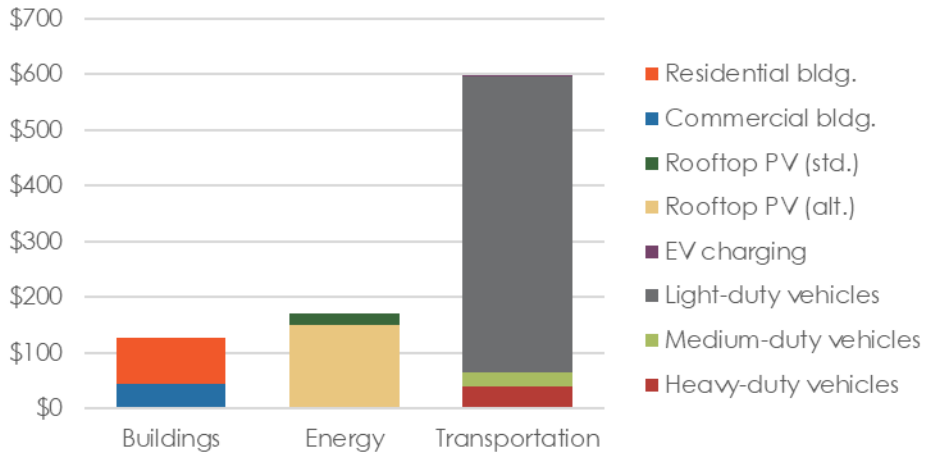
Our initial results indicate that nationwide investment needs in GGRF priority project categories add up to $5.6 trillion through 2035. About $1.7 trillion (31%) of these funds will be needed in LIDCs—in line with the share of the U.S. population that lives in LIDC census tracts (Figure 1). National investment needs in the priority project categories amount to $703 billion through 2025, and then accelerate to $1.7 trillion in 2026-30 and $3.2 trillion in 2031-35. On an annual basis, national investment needs in these project categories amount to about $131 billion in 2023, increasing to $449 billion by 2030 and $761 billion by 2035. These estimated investment needs accelerate over time due to the NZA project's assumptions about decreasing technology costs, which make it more cost-effective to back-load deployments, as well as assumptions about increasing demand for goods and services as the economy grows.

Figure 1: National GGRF investment needs ($ trillion)



Zero-emission transportation accounts for the largest share of total investment needs through 2035 at $4.7 trillion, with light-duty electric vehicles (i.e., personal cars) accounting for $4.0 trillion (of which $1.2 trillion is needed in LIDCs) (Figure 2). While it may be difficult to deliver new electric vehicles (EVs) at scale to LIDCs due to their relative cost, these figures highlight the need for clean transportation options in these communities. The needs estimates included figures for medium- and heavy-duty vehicles that include buses and other forms of public transit, but these likely do not account for the potential for a

Figure 2: National LIDC investment needs, 2020-30 ($ billion)



transformational increase in funding for public transit to reduce GHG emissions. Therefore, GGRF stakeholders could interpret the needs estimates for light-duty EVs to reflect the overall need for clean transportation in LIDCs, including public transit. Additionally, these needs estimates may indicate the potential for used-EV financing options in LIDCs.

Investment needs for net-zero buildings total $806 billion through 2035 ($259 billion in LIDCs); within this project category, residential heat pump space heating was the project type with greatest financing need, at $247 billion through 2035. Commercial electric cooking units and commercial heat pumps for space heating also account for large shares of investment needs within this category. As mentioned above, these figures only include the cost of installing the electric appliances (in both existing and to-be-constructed housing stock), and not the cost of constructing the new affordable housing in which they may be installed.

Total investment needs for rooftop photovoltaic (PV) panels add up to $100 billion through 2035 under our standard estimate,[11] with $28 billion of this needed in LIDCs. Unlike other GGRF priority project categories, investment needs in rooftop PV are front-loaded: they total $50 billion through 2025 and decline to $26 billion and $24 billion in 2026-30 and 2031-35, respectively. This contrast with the back-loaded timing of overall investment needs likely reflects the degree to which PV panels are already cost-competitive, which allows prime locations for their deployment to be implemented sooner.

However, due to certain modeling decisions made by our underlying data source (described in detail in the next section), we also produce an alternative estimate of rooftop PV needs, indexed to utility-scale PV needs. Under this alternative estimate, national investment needs for rooftop PV jump to $968 billion through 2035 (bringing total investment needs across all GGRF priority project categories up to $6.5 trillion), of which $238 billion is needed in LIDCs. Under this estimate, investment needs start at $229 billion through 2025, accelerate to $376 billion in 2026-30, then decline slightly to $363 billion in 2031-35. (See Figure 2 for technology-level breakdowns.)

[11] We note that rooftop PV panels was the only technology within the distributed energy generation and storage project area that we included in this iteration (see methodology section below).

Given the scale of these estimated investment needs, it is clear that the success of the GGRF will depend on its ability to catalyze investment from additional sources – particularly private ones – over the long term. In this regard, the GGRF's focus on LIDCs is appropriate, as demonstrations of GHG-reducing projects in these communities, combined with investments in TA, may catalyze larger-scale financing from traditional lenders in future.

2.3 METHODOLOGY

We produced our first iteration of these estimates using data from the Princeton NZA project, which has produced detailed data on potential net-zero pathways for the U.S. The NZA pathways consist of various mixes of renewable energy, energy efficiency, and clean technologies, deployed on different timetables from 2020 to 2050, that lead to net-zero GHG emissions for the U.S. by 2050.

However, it is important to note some features of the NZA project that affect our estimates. As mentioned above, the project only covers the continental U.S., so we have not estimated the investment needs for Alaska, Hawaii, Puerto Rico, or the other U.S. territories. Second, the project concluded in 2021 and its pathways specify technology deployments starting in 2020. Accordingly, our estimates of total investment needs through 2050 (or any interim year) include those corresponding to NZA pathway technology deployments starting in 2020. Users should not assume that reported investment needs for the years 2020-23 have been met; it is likely that many of them were not and will therefore have to be "made up" in future years to remain on that NZA pathway.

To produce our estimates of investment needs, we have selected a single NZA pathway (the "E+" pathway, representing aggressive end-use electrification for buildings and transportation), and then identified those technologies within the NZA data that fall under the three GGRF priority project categories. As the NZA data are available only at the state level, we developed various methodologies to "downscale" the technology-level data we selected to the census tract level. We then used projections of the cost of those technologies from the Energy Information Administration (EIA), National Renewable Energy Laboratory (NREL), and International Council on Clean Transportation (ICCT) to produce estimates of the total investment required in each technology, in each census tract, for each year through 2050.

While these estimates do not cover all project types eligible for GGRF finance, we believe they can provide a quantitative basis as well as an understanding of the order of magnitude of finance needs on which to begin developing plans to allocate these funds. We will incorporate additional technologies from other data sources in the second phase of our work where possible. Below, we detail the NZA technologies we selected and the methods used to downscale the NZA data to the census tract level.

2.3.1 DISTRIBUTED ENERGY GENERATION AND STORAGE PROJECTS

The only technology covered by the NZA in this GGRF project category is distributed (or "rooftop") PV panels. Because utility-scale PV is (and will likely remain) so much cheaper per unit of generating capacity than rooftop PV, the model the NZA team developed to optimize net-zero pathways always chooses to deploy utility-scale rather than rooftop PV. The NZA team compensated for this by exogenously specifying a moderate increase in rooftop PV deployment in the E+ pathway. This specification forms the basis of our "standard" estimates of rooftop PV investment needs.

Due to the emphasis on distributed solar generation in the GGRF and the extension of solar tax credits in the IRA as well as its direct pay provisions, we also calculated an alternative estimate of rooftop PV additions. For each state in each year, the alternative rooftop PV measure is equal to the NZA pathway data for utility-scale solar for that year, multiplied by the ratio of rooftop PV to utility-scale solar (in that state) in the year 2020. In most geographies, this produced significantly higher estimated investment needs for rooftop PV.

For both the NZA-provided and alternative estimate of rooftop PV, we downscaled state-level data on rooftop PV capacity additions in each year based on the number of structures per census tract. That is, we assumed that a given census tract's share of the state's total rooftop PV capacity added in a given year (according to the NZA pathway) is equal to that tract's share of the number of structures in the state in 2021.[12]

In the next phase of our research, we will seek to include estimates for additional types of distributed energy projects, such as battery storage and distributed wind projects.

[12] Data on the number of structures per tract were sourced from FEMA.

2.3.2 NET-ZERO EMISSIONS BUILDINGS PROJECTS

The NZA pathway includes ten technologies in this GGRF project category; for both residential and commercial buildings, these data include sales of:

- Electric heat pump space heating units,
- Electric resistance space heating units,
- Electric heat pump water heating units,
- Electric resistance water heating units, and
- Electric resistance cooking units.

For technologies in residential buildings, we downscaled the state-level data based on the number of housing units in each census tract.[13] For commercial buildings, we used the Department of Energy's 2021 County Commercial Buildings Inventory and data from the Federal Emergency Management Agency (FEMA) on the total number of structures per county to calculate the ratio of commercial to total structures per county; we then estimated the number of commercial structures per census tract as the number of structures in a given tract multiplied by the countywide ratio of commercial to total structures. We then used the latter figure to downscale the NZA commercial buildings data to the census tract level.

2.3.3 ZERO EMISSIONS TRANSPORTATION

The NZA data for this GGRF project category focus on vehicle sales and vehicle charging infrastructure, specifically sales of:

- Heavy-duty electric and hydrogen fuel-cell vehicles,
- Medium-duty electric and hydrogen fuel-cell vehicles,
- Light-duty electric and hydrogen fuel-cell vehicles,
- Capital invested in public 220-volt (level 2) and direct current fast (level 3) EV charging infrastructure.[14]

We downscaled state-level data for all of these technologies based on the number of person-miles traveled in each census tract (weekday average). We used person-miles,

[13] According to the American Community Survey's 2021 five-year estimates.
[14] For reference, level 2 chargers generally deliver 12–80, miles of charge per hour, and level 3 chargers provide 3–20 miles of charge per *minute*.

rather than vehicle-miles, to account for people who primarily take buses or ride as passengers, who are likely to form a greater proportion in LIDCs than in wealthier communities.

2.3.4 COST ESTIMATES

To produce estimates of investment needs, we multiplied the NZA technology data by price forecasts for the various technologies for each year through 2050. Rooftop PV costs were retrieved from NREL's 2022 Annual Technology Baseline. We used data pertaining to the national average installed capital expenditure costs, not factoring in operations and maintenance, to align with the intended use of the GGRF funds.

Cost data for zero-emissions buildings technologies were retrieved from the EIA's Updated Buildings Sector Appliance and Equipment Costs and Efficiencies. We used the total installed cost value for each technology, and used typical efficiency where efficiency data were given. Where only minimum and maximum price estimates were given, we took the simple average of the two. For residential electric heat pump space heating units, we took the simple average of the cost data for air-source heat pumps and ductless mini-split air-source heat pumps. For commercial electric heat pump technologies, we used cost data for air-source or rooftop heat pumps.

Cost data for light-duty zero-emissions vehicles were gathered from the EIA's 2023 Annual Energy Outlook. We used the price estimate for a midsize car (with a 200-mile range) as a conservative estimate of an average light-duty vehicle for both the EV and hydrogen fuel cell light-duty vehicles. Cost data for medium- and heavy-duty zero-emissions vehicles were gathered from the ICCT's working paper, Purchase costs of zero-emission trucks in the U.S. to meet future Phase 3 GHG standards. For both EV and hydrogen fuel cell medium-duty vehicles, we took the average of the cost projections for class 4-5 and class 6-7 vehicles. For both EV and hydrogen fuel cell heavy-duty vehicles, we took the average of the cost projections for class 8 straight trucks, class 8 short-haul tractor trucks, and class 8 long-haul tractor trucks to provide an average estimate of the price of a heavy-duty vehicle of each technology type.

2.3.5 IDENTIFICATION OF LOW-INCOME AND DISADVANTAGED COMMUNITIES

To facilitate the prioritization of GGRF funds for LIDCs, we identified those census tracts that qualify as such under the GGRF criteria. These include communities classed as "disadvantaged" by the Climate and Economic Justice Screening Tool (CEJST) and communities at or above the 90th percentile for the 13 EJScreen supplemental indexes.

At this point, we have not separately identified Tribal Lands within the data set, but we will seek to make this distinction in the next phase of our research. We also do not include geographically dispersed low-income households and properties providing affordable housing as it is infeasible to identify these categories of LIDCs in aggregate, though these are also eligible according to the GGRF notices of funding opportunity (NOFOs).

2.4 FEEDBACK

We welcome feedback from GGRF stakeholders on the methodology we have developed, our initial results, and our plan for enhancing our estimates going forward. In particular, we would appreciate any ideas on how our estimates or the presentation of the data could be made more useful for developing applications for the GGRF competitions and/or executing on successful GGRF applications.

In particular, we plan to undertake the following to improve our data:

1. Develop estimates of investment needs for census tracts in Alaska, Hawaii, and Puerto Rico.
2. Expand the scope of project types covered within the distributed energy generation and storage GGRF project area, particularly to include battery storage and distributed wind generation;
3. If feasible, expand our coverage of investment needs in LIDCs to distinguish Tribal Lands as specified in the GGRF NOFOs; and
4. Develop an interactive data map to allow GGRF stakeholders to view and analyze our estimates of investment needs at the census tract level.

3. CURRENT CLIMATE FINANCE FLOWS AND BARRIERS TO INVESTMENT

3.1 NATIONAL-LEVEL FLOWS

Since 2011, CPI has developed and deployed groundbreaking methodologies to track global climate finance, notably in our Global Landscape of Climate Finance reports.

In our most recent comprehensive estimates, presented in the 2021 Global Landscape of Climate Finance report[15], we tracked globally an annual average of $653 billion in total climate finance, with $82 billion in total climate finance in the U.S. on average in each of 2019-20[16]. The U.S. energy systems sector received by far the largest share of financing during this period, at an annual average of $61.5 billion, followed by the transport sector at an average of $15.5 billion.[17]

These flows pale in comparison to the investment needed in order to achieve net-zero GHG emissions in the US by 2050, which we estimate at $171 billion in 2025, accelerating to $449 billion by 2030, for just the three GGRF priority project categories (see Section 2).

Comprehensive data on current climate finance flows to LIDCs in the U.S. are unavailable. There is currently no aggregate or sectoral source of climate finance flows data that provides information on, for example, national investment in green affordable housing, EV sales to low-income customers, or climate resilience investments. However, available data, for example on EV adoption, show that low-income customers make up

[15] https://www.climatepolicyinitiative.org/publication/global-landscape-of-climate-finance-a-decade-of-data/
[16] CPI presents climate finance data as annual averages of two years to smooth fluctuations.
[17] It is important to note that neither CPI nor any other organization has conducted an in-depth analysis of all U.S. climate finance that includes both widely available climate finance data (such as renewable energy project investments) and estimates for sectors that are less reported. For example, reporting on climate finance is limited for both public and private entities, particularly in GGRF-relevant areas such as energy efficiency and transport. Accordingly, while our data are as comprehensive as possible, they do not track all U.S. financial flows for GGRF priority project categories. The only other organization that has comprehensively estimated U.S. climate-related investment is Bloomberg NEF, which has looked at all U.S. energy transition investment, estimating $141 billion in 2022.[17]

just a small share of buyers.[18] There is furthermore no data that describes the intersection of climate finance with other complementary investment flows.

3.2 CLIMATE FINANCE FLOWS OF POTENTIAL GGRF INTERMEDIARIES

Similar to sector destination climate finance data, data on sources of climate finance in the U.S. are also not readily available. For potential GGRF intermediaries - state, local, and tribal governments, green banks, and CDFIs – very little aggregate data are available on current climate financing by source, sector, and geography. CPI is currently engaged in a project to track public and private climate finance flows in the state of California but is unaware of similar exercises in other states. Below we summarize available data from green banks and CDFIs.

Since 2011, U.S. green banks have made $4.2 billion in cumulative investments and mobilized an additional $10.7 billion from co-investors. In 2022, green banks nationally deployed $1.5 billion in funds, which mobilized an additional $3.1 billion from private co-investors. Of this $4.6 billion total in 2022, $1.25 billion went to LIDCs.[19]

There are 1,380 CDFIs across all 50 states, the District of Columbia, Guam, and Puerto Rico with aggregate assets of $247 billion.[20] Aggregate information on annual lending and climate financing from all CDFIs is not available, but some networks of CDFIs provide some information. For example, the Opportunity Finance Network (OFN) is an organization of more than 390 CDFIs that extended nearly $9.2 billion in financing in 2021 on $42 billion of assets, with 83% of borrowers in LIDCs; 55% of the network's members provide some form of green lending.[21] The OFN reports that CDFIs leverage $8 of private investment for every $1 of CDFI investment.[22]

[18] https://sciencepolicyreview.org/2021/08/equity-transition-electric-vehicles/
[19] American Green Bank Consortium and Coalition for Green Capital, Annual Report 2022 (March 2023); retrieved from: https://coalitionforgreencapital.com/agbc-partners-caused-record-4-6b/.
[20] https://www.cdfifund.gov/sites/cdfi/files/2023-01/CDFI_Fund_FY22_AFR_FINAL508.pdf
[21] https://cdn.ofn.org/uploads/2023/03/17155507/OFN-Research-Brief_Five-Key-Findings_updated-March-17-2023.pdf?_gl=1*dz38s1*_ga*MTY0MjU1NjQzMi4xNjg5MDg0MDQ5*_ga_XJR7QDGHSL*MTY5MDU2MDk4MS40LjEuMTY5MDU2MTA5OS40LjAuMA..
[22] https://www.ofn.org/cdfi-impact/

3.3 BARRIERS TO INVESTMENT

Regardless of comprehensive data, it's clear that climate investment in LIDCs today is far lower than the needs identified in the first part of this analysis. Therefore, the success of the GGRF requires addressing barriers that currently limit the participation of LIDCs in the transition to clean energy across the U.S. in a targeted manner. This section summarizes barriers frequently cited in the responses to the EPA's October 2022 request for information (RFI) from financial institutions, CDFIs, green banks, and other types of lenders.[23] A full list of RFI responses reviewed is in Annex 1.

Based on RFI responses, we have summarized commonly cited barriers, which generally apply to all GGRF project categories:

Finance Supply	Finance Demand - Household	Finance Demand - Commercial
• Lack of capacity (human, IT, balance sheet) to increase investment volumes and/or to lend to green projects • Lack of adequate financial products • LIDC investment risks	• Affordability and complementary investment needs • Low home ownership rates • Distrust of technology and external institutions • Capacity to navigate processes • Complexity and disconnect across levels of government (community, municipal, county, state)	• Low commercial space ownership rates • Access to finance • Workforce development • Capacity to navigate processes and complexity across levels of government

These barriers generally apply to all GGRF project categories; however, additional barriers specific to each project category and underlying technologies also apply.[24]

3.3.1 FINANCE SUPPLY BARRIERS

LACK OF CAPACITY. Creating and expanding impactful lending programs will depend on recognizing current barriers. A principal concern voiced by lenders in response to the RFI was the lack of capacity to handle the amount of loans needed. To offset new lending, portfolio capacity must be added to maintain standard capital requirements.

[23] More information on the RFI is available at https://www.regulations.gov/docket/EPA-HQ-OA-2022-0859.
[24] For details by technology/sector, UNH Carsey and NRDC's Equitable Strategy Roadmaps offer far more richness of detail. https://carsey.unh.edu/center-for-impact-finance/current-projects/equity-centered-collaborative-approach-greenhouse-gas-reduction-low-income-disadvantaged-communities

Similarly, operational capacity must increase as the size and scale of lending being offered increases. Organizational readiness to deploy emissions reducing technologies, serve LIDCs, and manage federal funds also need to be developed.

LIDC RISKS. Investing and lending in LIDCs is often seen as high-risk and/or challenging. Lenders need opportunities to demonstrate that credit risks in these communities can be successfully mitigated while scaling up financing volumes.

3.3.2 FINANCE DEMAND - HOUSEHOLDS

Low-income and disadvantaged households' limited participation in current paths to clean energy demonstrate the need for the GGRF, but there are significant barriers that must be addressed for a market transformation in low-income areas.

AFFORDABILITY AND COMPLEMENTARY INVESTMENT NEEDS. In many LIDCs, residents live in older homes with unsafe living conditions that require remediation prior to accessing clean energy investment. Removing mold, asbestos, lead paint, and other harmful contaminants, replacing roofs, addressing resilience, need to be addressed in addition to implementing priority project categories.

LOWER HOMEOWNERSHIP RATES. Minority households tend to have lower homeownership rates than non-Hispanic White households. As of 2019, homeownership rates among non-Hispanic White people were 79%, compared to 45.9% for Black people, and 50.1% for Hispanic people.[25] Renting populations do not always have the consent authorization from landlords to install energy efficient upgrades even if they are paying utilities and energy bills. Even if landlords wanted to install upgrades, previous federal tax credits such as the Nonbusiness Energy Property Credit and Residential Energy Efficient Property Tax Credit were unavailable to non-owner-occupied properties.[26]

DISTRUST. In disadvantaged communities there is a sense of distrust in investors and developers entering the community. Long-term residents in these communities fear rent increases and displacement. Limited exposure to savings opportunities and education

[25] https://www.frbsf.org/community-development/publications/community-development-investment-review/2021/august/the-racialized-roots-of-financial-exclusion/#_ftn7
[26] The Distributional Effects of US Clean Energy Tax Credits

about energy efficiency, electric vehicles, and retrofits lead to slow adoption, as well as distrust.

CAPACITY TO NAVIGATE PROCESSES. For time- and cost-burdened households and multi-family housing owners interested in realizing monetary savings through zero-emissions solutions, navigating programs and funding, vetting contractors, and the overall application process can be overwhelming. Access to information on quantifiable savings from such projects in a variety of formats such as online, in person, and through community outreach is crucial to increasing demand. Government programs and agencies at different levels may also be disconnected – a federal incentive may not be aligned with state or local incentives and regulatory requirements, for example. Tax incentives offered by different levels of government may also be misaligned and difficult for time-burdened households to fully access. Insurance requirements for different incentive programs may be difficult to decipher for homeowners and small business owners. This points to the need for CDFIs and others to provide project preparation, training, and hands-on technical assistance (development services) to borrowers and grantees of all sizes, but in particular those that are time- and cost-burdened.

3.3.3 FINANCE DEMAND – COMMERCIAL AND SMALL BUSINESS

Commercial and small businesses face similar barriers to low-income and disadvantaged households but also face unique barriers.

RENTING. Many minority-owned small businesses and businesses in disadvantaged communities rent their facilities. Such business owners cannot access financing for climate projects for rented properties without landlord consent. Navigating impactful clean energy solutions can also become overwhelming for small businesses with limited cash flow.

ACCESS TO FINANCE. Accessing finance is an acute issue for minority businesses. A study by the Federal Reserve analyzing data from the 2016 Small Business Credit Survey found that minority-owned firms are less likely to be approved for financing than those that are White-owned. The survey showed that only 40% of minority-owned businesses considered to be low credit risk were approved for the full amount of financing requested. In comparison, 68% of low-risk non-minority-owned businesses received their full credit requests. For medium- and high-risk firms, minorities received their full credit

request 21% of the time compared to 32% for others. Funding expansion for minority-owned firms was more difficult than for White-owned firms. Specifically, Black-owned firms are twice as likely to face challenges in expanding funding compared to white-owned ones.

WORKFORCE DEVELOPMENT. Having an effective workforce to complete projects is essential for reducing energy burden and emissions in LIDCs. Contractors and installers need a guaranteed stream of projects in order to commit time to training and developing their workforce. Minority-owned businesses in disadvantaged communities will likely need targeted outreach from and access to workforce development opportunities. Finding a culturally competent project workforce for each disadvantaged community is essential for creating trust and referrals within the community.

4. INITIAL REVIEW OF POTENTIAL TA MODELS AND FINANCING STRUCTURES

This section provides an overview of some of the technical assistance models and financing structures and opportunities that have emerged from CPI's desk research and early stakeholder interviews. The section will be expanded for the full report, due out in late 2023.

4.1 TA MODELS

For the GGRF to be successful, TA and capacity building are needed for lenders and their borrowers/grantees to increase their institutional capacity and for individuals, organizations and communities to build project pipelines and the necessary supportive market and ecosystem. The next phase of this project will dive more deeply into TA models but a few early takeaways and examples follow:

For lenders, TA should focus on expanding their climate financing capabilities and creating a steady stream of project demand within low-income communities. TA can support increasing capacity and improving processes to better serve the needs of borrowers, as well as improving processes for underwriting, originating, and servicing loans. Many community lenders, in particular CDFIs, already provide robust training and TA to borrowers in their traditional loan categories. This TA and capacity building (known as development services) is, in fact, one of the six criteria for CDFIs to receive their certification from the CDFI Fund of the U.S. Treasury. It is incumbent upon potential GGRF recipients and their partners, funders and co-financiers to continue and expand this model of hands-on delivery, which has contributed to the strikingly low default rate of CDFIs.[27]

For example, in 2021, Inclusiv launched a Solar Lending Professional Training and Certificate Program with the University of New Hampshire Carsey School of Public Policy, supported by funding from U.S. Department of Energy Solar Energy Technologies

[27] https://www.fitchratings.com/research/us-public-finance/strong-financial-profiles-loan-oversight-support-cdfi-credit-17-05-2023#:~:text=The%20median%2090%2B%20day%20delinquency,compared%20to%201.06%25%20for%20banks.

Office. Inclusiv is a CDFI intermediary whose members are community development credit unions. The program is open to community-based lenders, providing the skills needed to deploy or enhance solar lending programs in CDFIs. Over 200 lenders have already graduated from the program.[28]

To support project pipelines, TA should be channeled to create partnerships and networks with community-based organizations. For example, outreach programs could ease feelings of distrust within LIDCs and spur demand within rural communities and communities with limited access to finance. Such programs can create referral systems where solutions to different problems are directed towards specific lenders with financing for projects to solve the issues. TA is also needed for lenders to create and expand lists of vetted contractors and installers for projects.

4.2 ADDRESSING BARRIERS WITH FINANCING STRUCTURES

Implementing the GGRF in a way that catalyzes long-term growth in climate investment in LIDCs will require the participation of other sources of capital, including foundations, impact investors, commercial banks, institutional investors, and other government incentives and programs. The full report will discuss in detail potential financing structures that can blend and mobilize capital.

In stakeholder interviews to date, it's clear that one of the primary concerns regarding GGRF implementation is the speed at which institutions will need to build project pipelines, develop new products, and deploy funds. Therefore, in this report we have decided to highlight some needs that can be addressed with grant and concessional investment support from foundations and other concessional capital providers, in particular during the year leading up to GGRF fund disbursement as well as beyond, as the GGRF mandate will not be able to cover all costs.

Specifically, the GGRF ecosystem may benefit from the following types of co-financing from foundations:

[28] *Center for Resiliency and Clean Energy*. Inclusiv. (n.d.). https://inclusiv.org/initiatives/center-for-resiliency-and-clean-energy/

Category	Activities in need of funding
Applicant support	• Support for application development • Legal & accounting set-up • Capacity building for federal fund management • Capacity building / expert personnel to address gaps
Pre-development	• Support to community-based organizations, aggregators, and other networks to generate pipeline • Support to CDFIs to tailor development services for climate lending
Complementary services	• Concessional support for non-GGRF eligible complementary services such as home upgrades, resilience assessments and upgrades, and pre-commercial technology
Learning & accountability	• Knowledge development • Sharing of best practices • Co-creation activities and labs • Tracking systems to assess progress

4.2.1 APPLICANT SUPPORT

Applying to the GGRF will be an extremely time and resource intensive process. Since the applicants will be nonprofit organizations and state and local governments, they will be likely to benefit from some funding and human resource support through the application deadline in October. For example:

- *Federal fund management:* Selected applicants will likely benefit from support with setting up systems and teams that can effectively take in, disburse, monitor, and report on federal funding.

- *Institutional set up costs:* To the extent that new institutions are being created, they will also incur high set-up costs, such as legal and accounting fees to register and set up financial systems and appropriate governance.
- *Impact measurement:* They may also need support to set up frameworks and IT systems that allow them to measure their impact on LIDC communities across a range of metrics, including GHG emissions, jobs, health outcomes, and wealth creation.
- *Personnel:* Applicants may also benefit from support for personnel positions that address some of their capacity gaps. For example, CDFIs will benefit from climate expertise, whereas green banks will benefit from community engagement expertise.

4.2.2 TECHNICAL ASSISTANCE

Reducing the "costs of customer acquisition" – or put simply, making sure there's enough demand for GGRF-funded projects – will be critical to the success of the GGRF program. Philanthropic foundations can step in even before applicants are selected and awards disbursed, to support community-based organizations with the engagement that will be required to identify potential projects and move those projects through the development process.

In addition, financial institutions themselves will need TA – to enhance their development services, develop new financing and business models, increase capacity in financing climate-related technologies (for community lenders) and increase capacity in LIDC finance (for green banks) and more.

Finally, both communities and financial institutions will need TA to navigate and piece together the many different federal, state, and local funding opportunities and incentives, including other incentives from the Inflation Reduction Act such as tax credits.

4.2.3 FUNDING COMPLEMENTARY SERVICES

GGRF funding will be restricted to projects that directly reduce emissions and to commercial technologies. However, successful deployment of GGRF funds is likely to require complementary funding that can address more holistic needs and contribute to

a longer term and more profound impact on the LIDCs in question, such as increasing income and wealth, improving health outcomes, and enhancing resilience to climate impacts.

For example, a simple solar and storage project coupled with resilience adaptation modifications can create a host of safety, health, equity and disaster risk reduction co-benefits, increasing the "return on resilience value" and the necessary return on investment implicit in the deal creation. A rooftop solar project may require financing for a new roof, upgrading of residential electrical systems, and resilience investments to ensure that the solar rooftop is able to withstand climate related shocks. A rooftop solar installation may also take advantage of new technology to reduce costs or address some of the other issues, even if using commercial panel technology. None of these costs seem to be eligible for GGRF resources.

While foundations may not be able to cover all these costs – and in fact, other types of funding are likely better placed to cover them, including co-lending from CDFIs themselves and other blended finance approaches – they may be able to support some costs, particularly those related to tools, financing structures, and capacity building to allow lenders to improve development services and offer tailored products. In addition, foundations and other impact investors can play a role in providing capital to advance early stage, transformational technologies that will not be GGRF-eligible but can reduce project costs over time, such as improved energy storage solutions or smart energy load management systems that reduce the need for electrical upgrades. There is also a role for other government programs at local, state, and federal levels, to offset some of the costs of complementary services.

4.2.4 LEARNING AND ACCOUNTABILITY

One of the most important markers of success for the GGRF will be whether the funding catalyzes longer term change in the institutions that deploy its funds and the communities it serves, including whether climate investments continue to be made in LIDCs after the initial GGRF resources are spent down.

However, beyond the monitoring that the EPA will do to ensure that grantees are meeting their expected outputs, there are no provisions related to the competition to fund regular learning and best-practice knowledge sharing among recipients. In addition, independent tracking of progress – for example, tracking of climate finance

deployed to LIDCs, understanding how funds are being deployed – is critical to support the long-term goals of this historic investment.

5. CONCLUSIONS AND NEXT STEPS

This interim report has made the case that the *how* of the GGRF – how the funds will be deployed most effectively to meet the needs of LIDCs, businesses, and individuals – is just important as the *who* – who will win the competitions?

In particular, the report has shown the following:

1. Investment needs greatly outweigh both current climate finance flows and the potential for GGRF resources to meet all needs, meaning that GGRF resources must be immediately catalytic, and must also catalyze long term transformations that sustain the needed investments into the long run.
2. Barriers for investment, which are present at the levels of both supply and demand for finance, need to be addressed with targeted TA and appropriate financing structures. In particular, over the next 6-12 months TA is especially needed to generate project pipelines so that GGRF funds can be quickly deployed once competition winners are selected and funding is disbursed. There is a particularly clear role for foundations to participate in this time frame to ready communities, lenders, and ecosystems for the implementation of the GGRF.

CPI will be further developing this report in the coming months to offer more insights on many of the issues touched upon in this interim report, as well as to present case studies and recommendations for different GGRF stakeholders. The final report is expected to be published in late 2023.

ANNEX 1: GGRF RFI RESPONSES REVIEWED

1. *Memo Opening Docket for Public Access.* (2022, October 21). US Environmental Protection Agency. https://www.regulations.gov/document/EPA-HQ-OA-2022-0859-0001/comment
2. *Response to RFI submitted by African-American Credit Union Coalition (AACUC).* (2022, December 8). US Environmental Protection Agency. https://www.regulations.gov/comment/EPA-HQ-OA-2022-0859-0312
3. *Response to RFI submitted by BlueHub Capital, Inc.* (2022, December 6). US Environmental Protection Agency. https://www.regulations.gov/comment/EPA-HQ-OA-2022-0859-0086
4. *Response to RFI submitted by Calvert Impact, Inc.* (2022, December 7). US Environmental Protection Agency. https://www.regulations.gov/comment/EPA-HQ-OA-2022-0859-0250
5. *Response to RFI submitted by Center for Impact Finance, University of New Hampshire Carsey School of Public Policy.* (2022, December 6). US Environmental Protection Agency. https://www.regulations.gov/comment/EPA-HQ-OA-2022-0859-0059
6. *Response to RFI submitted by Coalition for Green Capital (CGC).* (2022, December 7). US Environmental Protection Agency. https://www.regulations.gov/comment/EPA-HQ-OA-2022-0859-0258
7. *Response to RFI submitted by Coastal Enterprises, Inc. (CEI).* (2022, December 6). US Environmental Protection Agency. https://www.regulations.gov/comment/EPA-HQ-OA-2022-0859-0066
8. *Response to RFI submitted by Inclusiv.* (2022, December 8). US Environmental Protection Agency. https://www.regulations.gov/comment/EPA-HQ-OA-2022-0859-0365
9. *Response to RFI submitted by Opportunity Finance Network (OFN).* (2022, December 8). US Environmental Protection Agency. https://www.regulations.gov/comment/EPA-HQ-OA-2022-0859-0314
10. *Response to RFI submitted by RMI.* (2022, December 7). US Environmental Protection Agency. https://www.regulations.gov/comment/EPA-HQ-OA-2022-0859-0152

11. *Response to RFI submitted by Quantified Ventures.* (2022, December 8). US Environmental Protection Agency. https://www.regulations.gov/comment/EPA-HQ-OA-2022-0859-0310

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