CIF CLIMATE INVESTMENT FUNDS

SREP GHG EMISSION REDUCTIONS BY TECHNOLOGY

An in-depth analysis of GHG emission reductions in the SREP portfolio

// November 2023

RESULTS DEEP DIVE SERIES//

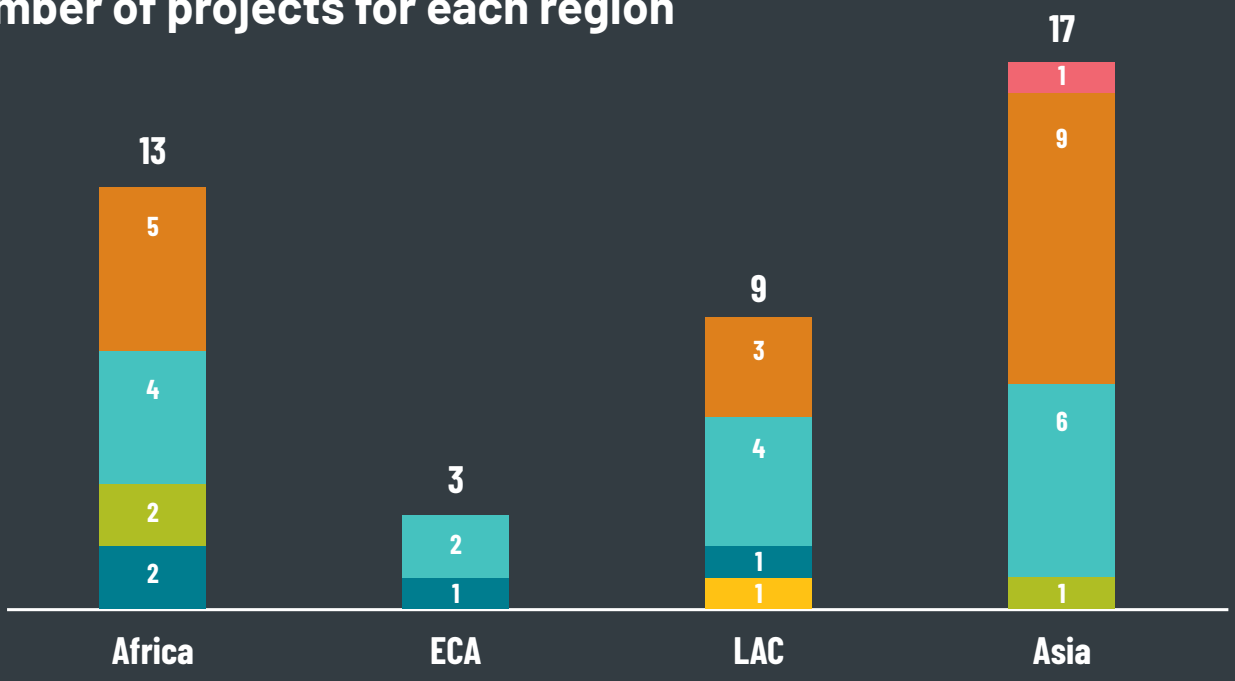
CIF Program: Scaling Up Renewable Energy Program in Low-Income Countries (SREP)

TOPICS

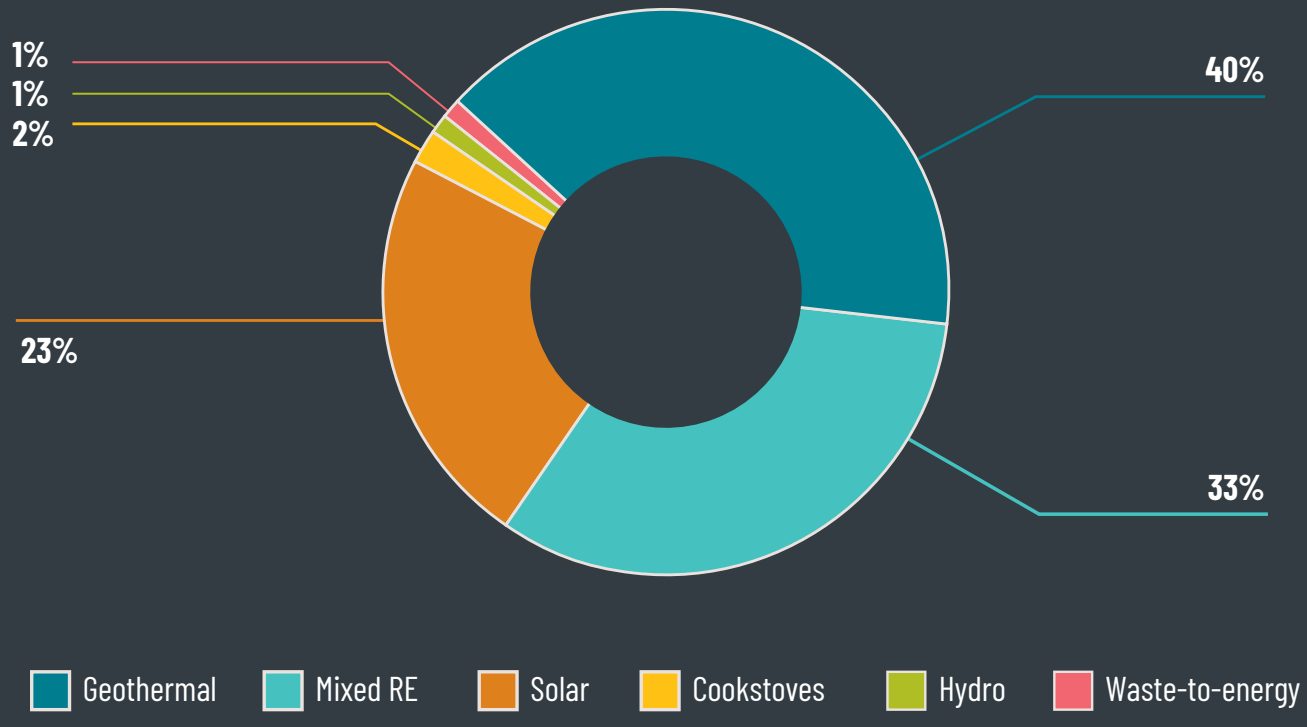
- Results and Impact
- GHG emissions
- Renewable energy technologies

RESULTS FROM SREP PROJECTS BY TECHNOLOGY

Number of projects for each region



Total targeted GHG emission reductions by technology



ACKNOWLEDGMENTS

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RESULTS DEEP DIVE SERIES

The Climate Investment Funds (CIF) is committed to rigorous and inclusive monitoring and reporting (M&R) on investments' contributions toward net-zero emissions and adaptive, climate-resilient, just, and socially inclusive development pathways. The M&R Results Deep Dive series is a supplement to CIF's annual results reports — while annual M&R provides a systematic synthesis of portfolio performance against each program's core indicators, the Deep Dives provide in-depth reviews of these results within specific thematic or developmental dimensions of climate change. As such, they offer greater granularity on the drivers and implications of various performance characteristics.

1. INTRODUCTION

This Results Deep Dive focuses on expected greenhouse gas (GHG) emission reductions through the Scaling Up Renewable Energy Program in Low Income Countries (SREP) Program of the Climate Investment Funds (CIF). SREP aims to enable the world's poorest countries to foster transformational change and pursue low-carbon energy pathways.[1] It seeks to increase overall energy access for the populations of partner countries; deliver economic uplift; and reduce reliance on fossil fuels. As a co-benefit of its interventions, it also aims to minimize GHG emissions. This Results Deep Dive examines the potential of GHG emission reductions of SREP funds by looking at annual expected emission reductions by technology and connection type in the current portfolio based on data for the reporting year 2023.[2,3]

Providing access to clean, affordable energy is critical to mitigating climate change while also improving the lives of millions of people around the world. It therefore constitutes a vital part of CIF's mission, and the CIF has supported the extension of electricity access to almost two million people since its inception in 2009. SREP focuses on a group of largely low-income and lower-middle income countries, aiming to fill a persistent gap these developing countries face—a shortfall in financing for transitions to clean, renewable energy.[4,5] In addition to directly supporting investments in clean energy and energy access, some SREP projects focus on strengthening the enabling environment to allow these investments to happen. SREP interventions support transitions to renewable energy, which play a key role in reducing GHG emissions and mitigating climate change at a global scale.

Menengai geothermal plant, Kenya

2. RESULTS OVERVIEW

The SREP portfolio comprises 42 projects[6] spread over four regions: Africa (13 projects), Asia (17 projects), Latin America and the Caribbean (nine projects), and Europe and Central Asia (three projects).[7] These 42 projects estimate a combined total of up to 3.5 million tons of CO_2 equivalent that can be expected to be reduced or avoided annually thanks to SREP interventions. Almost half of these 3.5 million tons will be reduced in the Africa region, with 27 percent in Latin America and the Caribbean (henceforth LAC), 21 percent in Asia, and 5 percent in Europe and Central Asia (henceforth ECA).

Zooming in on the regions, on average the Africa region shows the highest potential for GHG emission reductions per SREP-financed project with 125,766 tons of CO_2 equivalent, followed by LAC, ECA, and Asia. If looking at the average GHG emission reductions at the country level, LAC is the region where individual countries have the highest expected emission reductions, followed by Africa, ECA, and Asia.

Out of the 42 projects in the SREP portfolio, 17 projects are solar photovoltaic (PV) and 16 fall under mixed renewable energy (RE). There are only four projects in geothermal, although it is the technology that would potentially lead to the most GHG emission reductions (40 percent of total expected GHG emission reductions from the SREP portfolio, as shown in Figure 1).

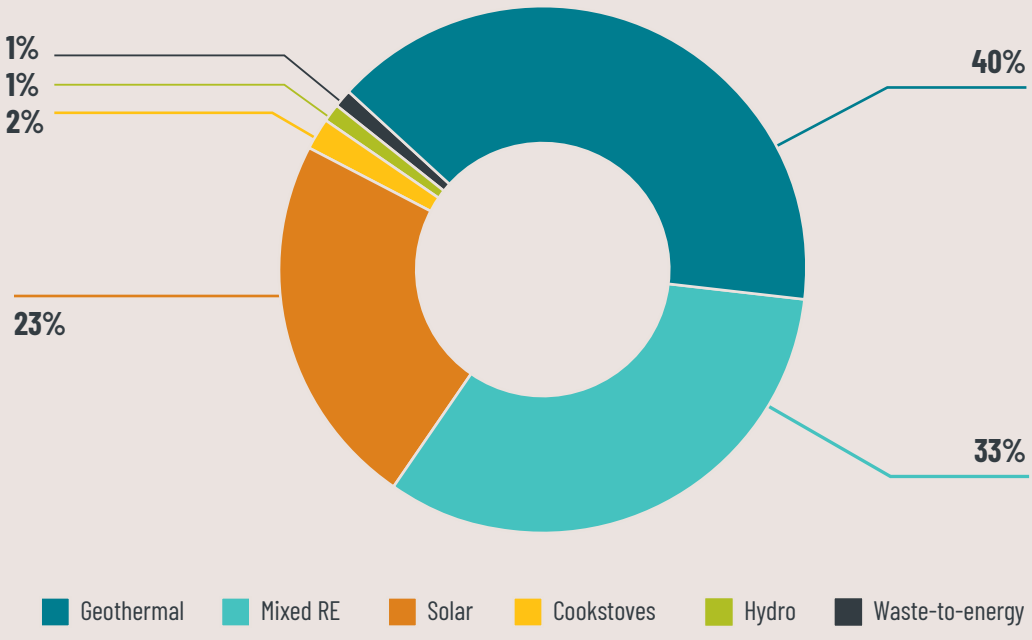

FIGURE 1. Total expected GHG emission reductions by technology in SREP portfolio (tons of CO_2 eq.)

Source: CIF analysis based on SREP portfolio data for reporting year 2023.

3. GHG EMISSION REDUCTIONS BY TECHNOLOGY AND CONNECTION TYPE

Of the four geothermal projects in the SREP portfolio, two together account for a third of the total expected GHG emission reductions across the whole portfolio. These are the Geothermal Sector Development Project in Ethiopia, and the Menengai Geothermal Development Project in Kenya. While these two geothermal projects have considerable GHG emission reductions potential, the SREP financing dedicated to them represents less than a tenth of the total SREP financing. When adding the two other geothermal projects, in Armenia[8] and Nicaragua, geothermal projects under SREP still only account for 12 percent of total SREP financing. The largest share of SREP financing goes to solar projects, followed by mixed RE, with 43 percent and 35 percent, respectively.

The high potential for GHG emission reductions of geothermal projects relative to SREP financing can be explained by two factors. First, SREP financing dedicated to geothermal projects is usually limited to exploratory drilling, which is the riskiest part of the project, and the expected impact on GHG emissions is considered beyond the drilling phase. Second, findings are in part driven by the results of the Menengai project, which attracted considerable co-financing and overachieved its target installed capacity by 13 percent. Figure 2 shows how the highest reductions in GHG emissions in tons of CO_2 equivalent per megawatt (MW) of installed capacity lie in geothermal projects, followed by hydropower, mixed RE, and solar power.

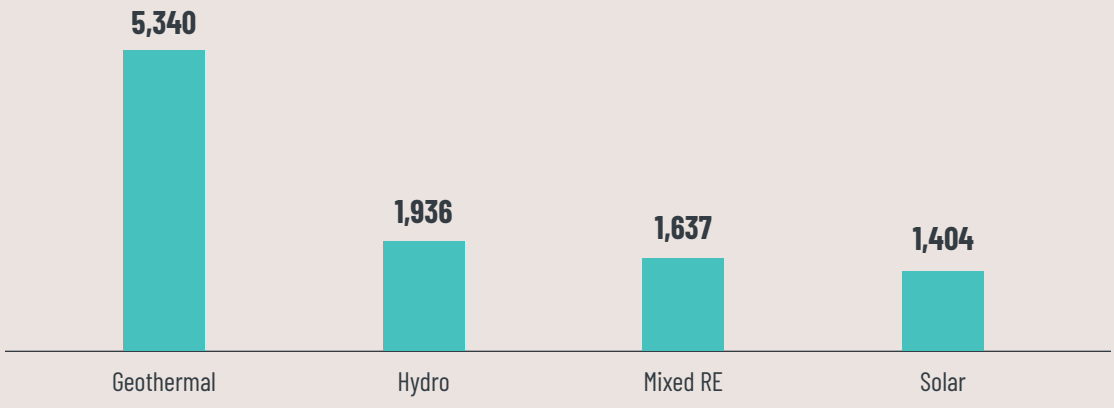

FIGURE 2. Average GHG emission reductions per MW of installed capacity by technology (tons of CO_2 eq.)

Source: CIF analysis based on SREP portfolio data for reporting year 2023.

A previously published Results Deep Dive (2022) examined SREP's co-financing ratio by connection type showed that SREP financing was split between on-grid projects (34 percent), off-grid projects (32 percent), mini-grid projects (30 percent), and both on- and off-grid projects (4 percent)[9]. When looking at expected GHG emission reductions by connection type, almost three-quarters of the SREP-financed projects can be attributed to on-grid investments (Figure 3). All geothermal projects are on-grid. Other on-grid investments include solar and mixed RE projects. In terms of off-grid investments, these are mostly solar projects, with a few mixed RE projects. There is only one cookstoves project, and one waste-to-energy project in the SREP portfolio. Both of these are off-grid as well. The remaining mini-grid investments include solar, mixed RE, and hydropower projects.

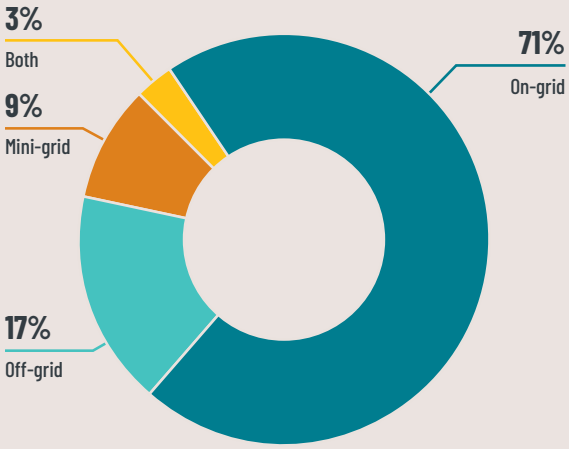

FIGURE 3. Share of GHG emission reductions by connection type (%)

Source: CIF analysis based on SREP portfolio data for reporting year 2023.

Wind turbines in Pushkin Pass, Armenia

4. CONSIDERATIONS

When looking at the amount of expected GHG emission reductions per US$ million coming from SREP funding, ECA appears to be the region that achieves the highest reductions per dollar, with over 13,000 tons of CO_2 emissions reduced per US$ million invested (Figure 4). It is worth noting that there are only three projects in the ECA region portfolio, which are all located in Armenia. Two are mixed RE, and one focuses on geothermal energy. The outstanding result for ECA is largely driven by the Geothermal Exploratory Drilling Project. LAC comes second, with 12,196 tons of CO_2 reduced per US$ million invested under SREP. The LAC project driving this figure is the Grid-Connected Renewable Energy Development Support (ADERC) Transmission Phase I and II in Honduras. Transmission infrastructure investments have a considerable impact on GHG emissions, as the carbon accounting exercise considers the fully integrated electricity network. As such, transmission lines can reduce emissions by enabling renewable energy integration, thereby displacing fossil fuels generation coming from either imports or local production. In the case of system expansion with renewable energy integration, the new transmission line would reduce fossil fuel generation from off-grid diesel generators. Transmission investments can also reduce GHG emissions through their impact on service reliability, and transmission network losses.[10]

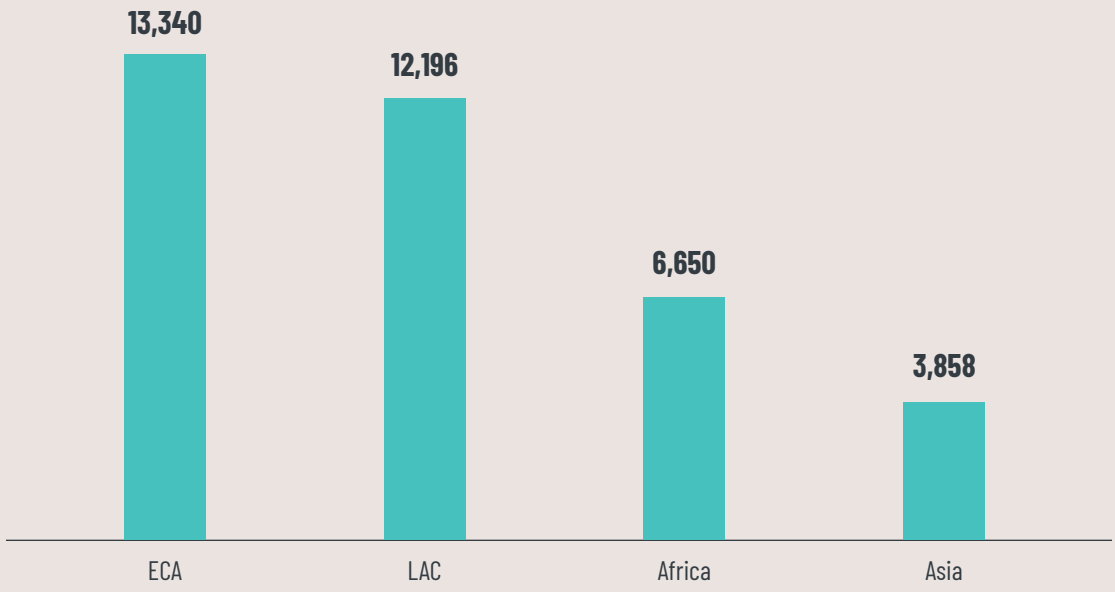

FIGURE 4. Amount of expected GHG emission reductions per US$ million invested by SREP by region (tons of CO_2 eq.)

Source: CIF analysis based on SREP portfolio data for reporting year 2023.

Unlike the ADERC project in LAC, SREP projects in Africa and Asia are not focused on transmission lines, and therefore show lower numbers of expected GHG emission reductions per US$ million invested. In Africa, only half the quantity of expected CO_2 emission reductions would be achieved compared to LAC. In Asia, these CO_2 emission reductions are even lower. These differences can be explained by three factors. First, two of the SREP portfolio geothermal projects with high GHG emission reductions potential are located in Africa (i.e., Ethiopia's Geothermal Sector Development Project and Kenya's Menengai Geothermal Development Project). Second, SREP projects in the Pacific Islands, such as those in the Solomon Islands and Vanuatu, are included in the Asia portfolio. These projects located on Small Islands Developing States (SIDS) might have higher upfront infrastructure costs relative to their impact on GHG emission reductions. Finally, the lowest ratio of expected GHG emission reductions to US$ million invested in the SREP portfolio is in Bangladesh, for the Off-Grid Solar PV project that focuses on pumping for agricultural irrigation. The purpose of this project is to improve power system efficiency, rather than reduce GHG emissions.

While the results above show high potential for geothermal projects to significantly reduce GHG emissions over their lifetime, the SREP Program focuses on countries with the lowest incomes rather than on countries with the largest potential in GHG emission reductions. The essence of the SREP Program lies in promoting access to electricity, and strengthening the enabling environment needed for investments in clean energy and energy access. Out of the SREP portfolio, six MDB-approved projects focus on the enabling environment. Figure 5 shows that almost half of SREP financing is dedicated to solar PV, as solar energy potential is high in the low-income countries the program targets. A bit more than a third of this financing goes to mixed RE, 12 percent to geothermal, and 9 percent to hydropower. One percent of SREP financing is allocated to cookstoves and 1 percent also goes to waste-to-energy, with the portfolio including one clean cookstoves project in Honduras and one biogas project in Nepal.

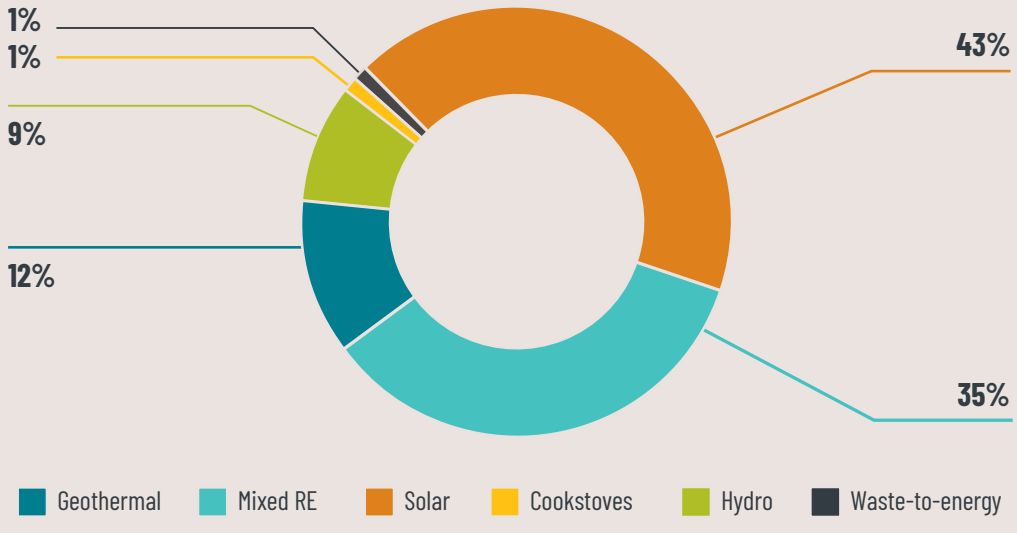

FIGURE 5. Total SREP financing by technology (%)

Source: CIF analysis based on SREP portfolio data for reporting year 2023.

5. CONCLUSIONS

Reducing GHG emissions is a top priority for many governments, as well as for the CIF, given that this represents one of the key mitigation actions to fight climate change. Several sectors are expected to reduce GHG emissions, with CIF investments directed at many of these sectors through its different programs, including renewable energy generation (REI), reforestation (FIP, NPC), and the phasing out of coal power plants (ACT), among others. SREP is one of the CIF programs that includes investments in renewable energy generation coming from either on-grid, off-grid, both, or mini-grid connections; seeks to foster transformational change, and works to enhance energy access. It finances a wide range of technologies, including solar, wind, geothermal, biomass, hydro, waste-to-energy, and cookstoves, as well as projects that incorporate a mix of technologies. SREP also supports the creation of an enabling environment for investments in these technologies.

Among the many benefits achieved by the SREP Program (and the CIF as a whole) is the reduction of GHG emissions, which is mapped as a co-benefit in the SREP Program. This Results Deep Dive has shown that the potential for SREP-financed investments to reduce GHG emissions is significant, with heterogeneity in the impact across the different regions, technologies, and connection types. Taking a closer look at the different types of technologies shows that geothermal is the technology with the largest potential for GHG emission reductions per US$ million invested and per MW of installed capacity.[11] This finding is explained by the long-term project benefits of initial investments in exploratory drilling, which can open the path to transformational investments in geothermal energy by de-risking this type of investment from the outset in countries that need it the most.

Geothermal energy pipeline

ENDNOTES

1 For more information about the SREP, see the program's website at https://www.cif.org/topics/energy-access.

2 Capacity-building projects are excluded, as they do not include GHG emission reductions targets.

3 Reporting year 2023 covers data reported for the period between January 1, 2022, and December 31, 2022.

4 ICF. 2022. Evaluation of the Scaling up Renewable Energy Program in Low-income Countries: Evaluation Report. https://www.cif.org/sites/cif_enc/files/knowledge-documents/srep_evaluation_report.pdf.

5 World Bank. 2023. Scaling Up to Phase Down: Financing Energy Transitions in the Power Sector. Washington, DC: World Bank. https://openknowledge.worldbank.org/entities/publication/312f8cc5-272c-4ed3-95cb-7357f204deee.

6 These exclude capacity-building projects for which no annual target GHG emissions are reported.

7 The list of countries in which SREP finances projects organized by region are the following. Africa: Ethiopia, Kenya, Lesotho, Liberia, Mali, Rwanda, and Tanzania; Latin America and the Caribbean: Haiti, Honduras, and Nicaragua; Asia: Bangladesh, Cambodia, Kiribati, Maldives, Mongolia, Nepal, Solomon Islands, Vanuatu; Europe and Central Asia: Armenia. More can be found at https://www.cif.org/topics/energy-access.

8 This project is closed and will not be further reported due to insufficient steam potential.

9 SREP Co-Financing Ratio by Grid Connection Type: An in-depth analysis of co-financing mobilized for the different grid connection types in the SREP portfolio. 2023. Washington, D.C.: Climate Investment Funds. https://cif.org/knowledge-documents/srep-co-financing-ratio-grid-connection-type.

10 See Annex III in the Power Sector Investment Projects: Guidelines for Economic Analysis, World Bank, 2016.

11 The potential for GHG emission reductions per US$ million invested is higher for cookstoves, but there is only one SREP project on cookstoves in the portfolio, and the installed capacity is not relevant for this project.

THE CLIMATE INVESTMENT FUNDS

The Climate Investment Funds (CIF) is one of the largest multilateral climate funds in the world. It was established in 2008 to mobilize finance for low-carbon, climate-resilient development at scale in developing countries. Fifteen contributor countries have pledged over US$11 billion to the funds. To date CIF committed capital has mobilized more than $64 billion in additional financing, particularly from the private sector, over 70 countries. CIF's large-scale, low-cost, long-term financing lowers the risk and cost of climate financing. It tests new business models, builds track records in unproven markets, and boosts investor confidence to unlock additional sources of finance. Recognizing the urgency of CIF's mission, the G7 confirmed its commitment to provide up to $2 billion in additional resources for CIF in 2021.

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