

Social Protection and Climate Change: How Can We Protect the Most Vulnerable Households Against New Climate Threats?

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SOCIAL PROTECTION AND CLIMATE CHANGE



How can we protect the most vulnerable households against new climate threats?

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Laura Goyeneche



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Social Protection and Climate Change:

How can we protect the most vulnerable households against new climate threats?

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After two decades of sustained progress in poverty reduction in the region of Latin America and the Caribbean (LAC), the trend has reversed. From 2000 to 2019, poverty in the region shrank from 45% of the population to 28% (IDB, 2021). Despite that progress, millions of households still face a fragile situation. Chronic poverty¹ and vulnerability persist, while transitory poverty² has become a growing concern for significant sectors of the population, especially informal workers and the emerging middle class. The pandemic underscored this fragility, driving 20 million people to extreme poverty in just one year and generating a 13-year setback in the fight against poverty (ECLAC, 2022). The inflationary crisis caused by Russia's invasion of Ukraine threatens to intensify this trend and could drive the number of people living below the poverty line up by an estimated 10 million individuals (IDB, 2022).

In this fragile context, climate change presents an additional threat to the region's poor and vulnerable households. Climate change refers to the long-term alterations of temperatures and climate patterns. Since the 19th century, the sustained increase in greenhouse gas (GHG) emissions linked to human activity has been the main driver of climate change. Currently, the Earth's temperature is 1.1 °C higher than it was at the end of the 19th century, and projections anticipate further deterioration of this trend (IPCC, 2022). This new climate scenario creates additional threats to the welfare of the region's poor and vulnerable households, and it is estimated that, without an adequate response, climate change could drive an additional 5.8 million people into poverty by 2030 (Jafino et al., 2020).

1. Chronic poverty refers to structurally marginal living conditions related to permanent shortage in a household's income and consumption levels.

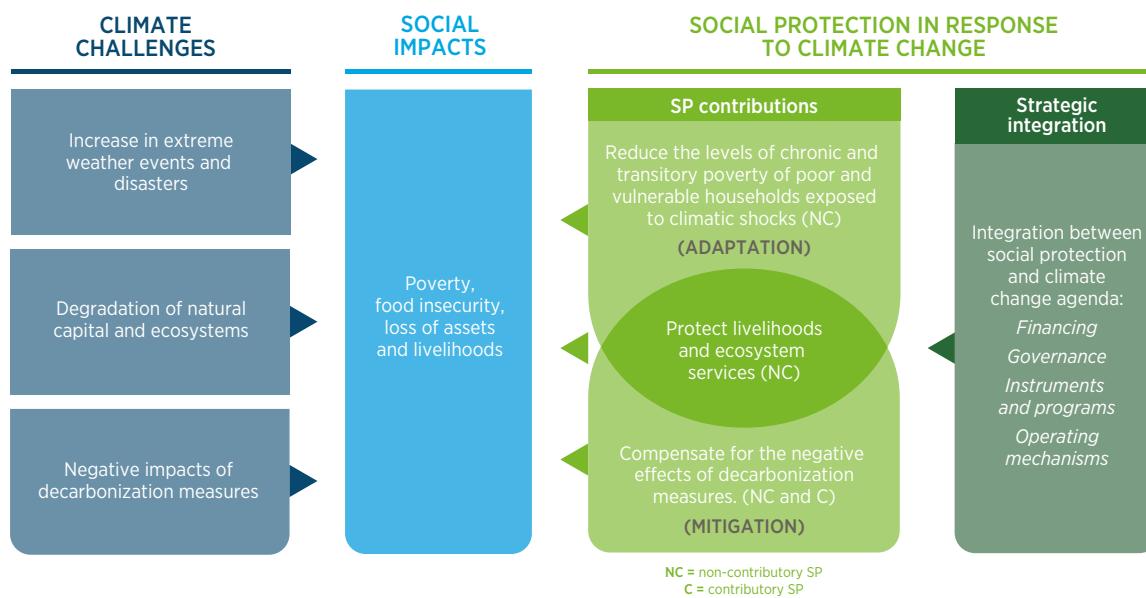
2. Transitory poverty refers to sudden increases in household poverty levels due to external shocks.

The purpose of this paper is to identify the main challenges to poverty reduction in the region due to climate change, and the potential role of social protection in this context.

To that end, we propose an analytical framework (see Figure 1) to identify the main threats arising from climate change and possible policy options to confront them. Phenomena directly associated with climate change – including increased frequency and intensity of extreme weather events and disasters, and the accelerated degradation of ecosystems – will have increasingly more severe consequences on households' assets, financial resources and income sources (IPCC, 2014). At the same time, decarbonization actions can also affect households' welfare, for example, by increasing prices of goods and services generated by the elimination of energy subsidies or income sources as a result of the conversion of contaminating industries (Saget et al., 2020). Beyond the short-term negative effects on the financial resources of poor and vulnerable households, these threats can also lead to medium- and long-term negative effects, especially if households make decisions and take courses of action that can hinder their future welfare (Báez and Mason, 2008).

FIGURE 1 CHALLENGES OF CLIMATE CHANGE AND THE ROLE OF SOCIAL PROTECTION SYSTEMS: A THEORETICAL FRAMEWORK

2



Source: Own elaboration based on Costella et al. (2021) and Costella et al. (2023).

In this context, social protection systems can play an important role in adaptation to and mitigation of climate change.³ This paper focuses on the role of non-contributive cash transfers to support poor and vulnerable households exposed to new climate threats. It also examines the potential role of contributive social protection instruments, such as unemployment benefits and pensions, especially to compensate for the adverse effects of decarbonization measures. In the face of extreme weather events and disasters, cash transfers⁴ can support poor households' income, consumption and financial resources, and potentially support their resilience.⁵ In the face of ecosystem degradation, cash transfers can help foster more environmentally friendly behaviors and actions while helping reduce poverty in the beneficiary areas. Cash transfers, unemployment benefits and pensions can support income and consumption levels in households affected by decarbonization measures, thus contributing to a more equitable and fairer path toward a zero-net-emissions economy. These social protection instruments can help moderate the potential damage caused by climate change (thus supporting the adaptation agendas) and support the efforts toward a fair decarbonization of the economy (thus favoring the mitigation agendas). However, while there are important opportunities for social protection mechanisms, there are also significant knowledge gaps and relevant challenges related to the coverage and efficiency of these instruments.

In the following sections, we will examine the new threats arising from climate change and their effects on poor and vulnerable households (Section 1), explain the possible contributions of social protection in tackling these new threats (Section 2), and pose alternatives to close the existing gaps and adapt social protection systems to the new challenges (Section 3).

3. Adaptation measures refer to the set of actions that seek to moderate the potential damage of climate change or leverage the opportunities it might generate. Mitigation measures refer to actions that seek to reduce greenhouse gas (GHG) emissions to reduce the frequency or severity of the effects of climate change. More information at: https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_annex-i.pdf.

4. In the rest of this document, "cash transfers" specifically refers to non-contributive cash transfers.

5. The resiliency of households and communities is defined as their capacity to remain at a given minimum income or welfare level in spite of the shocks brought on by extreme climate events and disasters (Barrett y Headley 2014).

1 THE CHALLENGE: CLIMATE CHANGE AND POVERTY

In this section, we identify the three main threats arising from climate change and their potential short-, medium- and long-term effects on poor and vulnerable households. This section is based on an analysis that combines poverty data, climate shocks and ecosystems in 17 countries in the region. The exposure of poor households to climate-related natural disasters and the intersection between poverty levels and high-value ecosystems are analyzed at the municipal level. Annex 1 presents details on the databases and methodology.

Extreme weather events, disasters, and poverty

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Of all the world regions, the Latin American and Caribbean region is the second-most prone to climate-related disasters, with a total of 1,347 disasters between 2000 and 2022, of which 91% were climate-related.⁶ The region is exposed both to rapid-onset phenomena (floods, hurricanes, etc., which cause shocks and disasters) and to slow-onset events (desertification, rise in average temperatures, progressively rising sea levels, etc.)⁷ which intensify the rapid-onset disasters. In the next few years, all these phenomena are likely to occur with increased frequency and intensity, with a growing number of intense events with extreme precipitations, mudslides, and droughts (IPCC, 2022).

Poor households are more exposed to natural disasters and suffer more from their impact.

In the LAC region, an estimated 78 million poor people or more live in areas that are highly exposed to climate-related shocks⁸ (see Map 1). Estimations for seven of the region's most

6. For more information on the international disaster database OFDA/CRED see: <http://www.emdat.be>.

7. In climate-change literature, the term “slow-onset events” refers to risks and impacts associated with rising temperatures, desertification, diminishing precipitations, loss of biodiversity, degradation of land and forests, the melting and retreat of glaciers, ocean acidification, and rising levels and salinization of oceans (IPCC, 2022). For more information, see: <https://unfccc.int/wim-excom/areas-of-work/slow-onset-events>. This term differs from the term “slow-onset disasters,” which is more commonly used in the disaster-risk-management literature, and which often refers to disturbances such as droughts, which develop slower than rapidly appearing disturbances.

8. Highly exposed areas are those subject to five or more disasters in the previous 10 years. We used data on data and climate shocks from Argentina, Bolivia, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru and Dominican Republic.



climate-vulnerable countries⁹ show that between 51% and 98% of poor people live in municipalities affected by at least five climate-related disasters in the previous 10 years (see Figure 1). In affected areas, disasters cause significant losses and increased risk of poverty. In Central America, it has been estimated that the increased intensity of hurricanes can cause losses of 0.9% to 1.6% of GDP and can increase extreme poverty by 1.5%. Calculations for the drought episodes that affected Nicaragua in 1997, 1998 and 2000 point to a 10% increase in the likelihood of households descending into poverty (Williams and Gonzalez, 2020).

Natural disasters have especially devastating financial consequences for the poorest people; for example, due to the destruction of housing, productive assets, income sources and support networks (Hallegatte et al., 2016). When disasters occur, poor and vulnerable households tend to lose proportionally more assets than more affluent households (Busso and Messina, 2020). Hurricane Mitch, for example, destroyed 18% of the assets of the poorest quintile of the Honduran population, compared to just 3% for the richest quintile (Morris et al., 2002). On average, when flooding or storms occur, poor people lose two to three times more than people who are not poor (Hallegatte and Rozenberg, 2017). Poor households also have fewer resources to prepare for and recover from the effects of climate shocks. For instance, they have fewer formal and informal support networks, as well as reduced access to formal savings and credit mechanisms, and insurance (Dabla-Norris et al., 2015; Nazrul and Winkel, 2017). Certain population groups, such as women and children, are more affected by the impacts of climate shocks. When disasters occur, women have a higher likelihood of dying (Neumayer and Plümper, 2007), suffer greater nutritional deficits (Casas, 2017) and are more affected by gender-based violence (UNFPA, 2012).

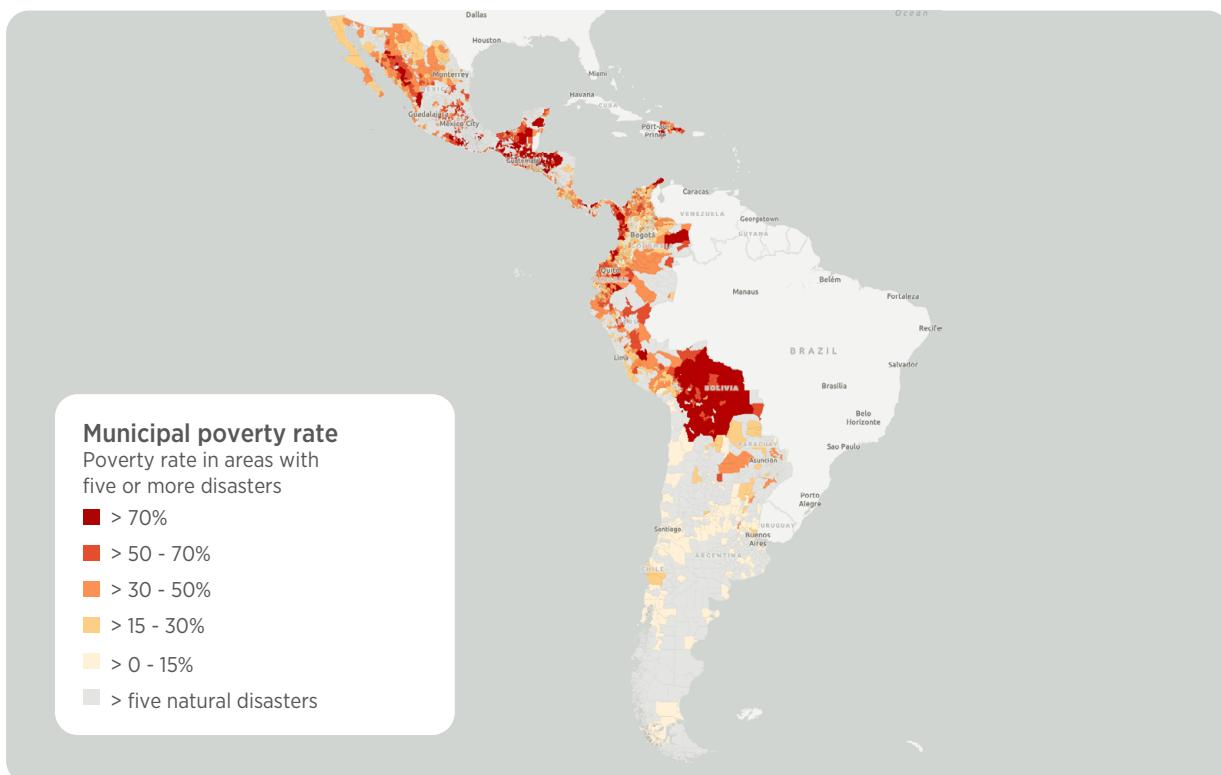
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Beyond their impact on the poor, extreme weather events and disasters affect the livelihoods of vulnerable groups; that is, of people and households that are not currently in poverty but are at risk of descending into poverty due to shocks. So climate shocks not only aggravate the problems of existing poverty, they also create new problems of transitory poverty.

9. To determine the 10 countries with "extreme" climate-change vulnerability, we use the Climate-Change Vulnerability Index (CCVI) available at: <https://www.maplecroft.com/risk-indices/climate-change-vulnerability-index> and the vulnerability index included in CAF (2014). We report information for only seven of those countries for which we have poverty-level information from the second administrative level.



MAP 1 POVERTY RATE IN AREAS EXPOSED TO FIVE OR MORE DISASTERS IN THE PREVIOUS 10 YEARS



Municipal poverty rate

Poverty rate in areas with five or more disasters

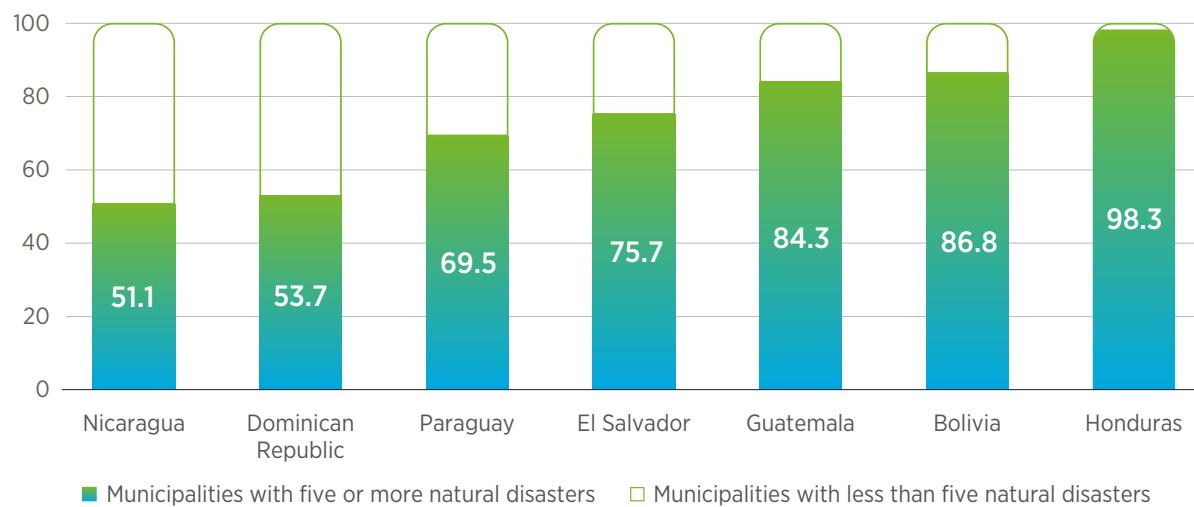
- > 70%
- > 50 - 70%
- > 30 - 50%
- > 15 - 30%
- > 0 - 15%
- > five natural disasters

6

Source: Prepared by authors based on natural disaster data from DesInventar and national poverty data (see Annex 1, Table A1).

Note: DesInventar does not have disaster data for Brazil. For further detail, see the map visualization tool at [Choques Climáticos y Pobreza](#).

GRAPH 1 PERCENTAGE OF POOR PEOPLE LIVING IN AREAS EXPOSED TO NATURAL DISASTERS OVER THE LAST 10 YEARS



Source: Prepared by authors based on natural disaster data from DesInventar and national poverty data.

Note: See Annex 1 for further details.

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Without support networks, the short-term loss of livelihoods can have adverse medium- and long-term consequences. There is ample evidence that extreme weather events and disasters, as well as other shocks, may lead poor and vulnerable households to adopt negative adaptation strategies. These strategies could involve, for example, selling productive assets, catastrophic expenditures, suspending medical controls, removing children from school, increasing child labor or exerting excessive pressure on natural resources to satisfy short-term needs. These decisions may have strongly negative consequences on future welfare, as they hinder households' accumulation of human capital and productive capacity and can lead to long-lasting poverty traps (Báez and Mason, 2008).



Natural capital degradation, ecosystems and poverty

Climate change—along with other human activities such as deforestation, flawed agricultural practices, overexploitation of resources, and contamination—is causing severe deterioration of ecosystems and natural capital in Latin America and the Caribbean (IPCC, 2022). In just 25 years (from 1990 to 2015), the region’s forested areas decreased by 14 percentage points, seven times the rate of the world average.¹⁰ The LAC region has also suffered the greatest biodiversity loss in the last 50 years in the entire world (Almond et al., 2022).

Poverty and natural capital degradation are closely linked phenomena that can reinforce each other. On one hand, the destruction of environmental assets affects poor populations, especially those in rural areas, whose livelihoods disproportionately depend on ecosystems (IPCC, 2022). On the other hand, poverty and the search to satisfy basic needs can lead to communities overexploiting environmental assets. This interaction becomes a vicious cycle in which poverty and natural-capital degradation reinforce each other, negatively impacting people and ecosystems and their biodiversity. It is important to clarify that poverty is not the only (nor the main) cause of the degradation of the region’s natural capital. For example, since 1990 in Amazonia, agro-industrial production for international markets has been the main cause of deforestation due to extensive grazing, soybean cultivation, oil palm plantations and other practices (FAO, 2016a).

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Poor people live in high ecosystem value areas. It is estimated that 116 million poor people live in high ecosystem value areas in the region¹¹ (see Map 2). In the five countries of the region with the highest biodiversity, on average, 71.5% of poor people live in areas of high-value ecosystems (Graph 2). At least 4.3 million poor people live in the Amazon area, the region’s highest reserve of biodiversity, with a 54% average municipal poverty rate.

The livelihoods of poor people disproportionately depend on the services and resources provided by ecosystems (PNUMA, 2009). For example, it is estimated that at least 92 million people living in poverty reside near highly valuable local land ecosystems (such as forests), as these can contribute to food security and provide fiber, fuel and wood-based products. In countries such as Honduras, Bolivia, Guatemala or Haiti, the income sources and food security of 30% to 50% of the population depend on agriculture,¹² which in turn

10. Forest surface area published by the World Bank, available at: <https://data.worldbank.org/indicator/AG.LND.FRST.ZS?locations=ZJ-1W>.

11. High-value ecosystems are those in which the concentration of high-value assets exceeded the regional median. Poverty data from the countries with the most biodiversity (Brazil, Colombia, Ecuador, Mexico and Peru) and 13 other countries (see Table A3 in Annex 2).

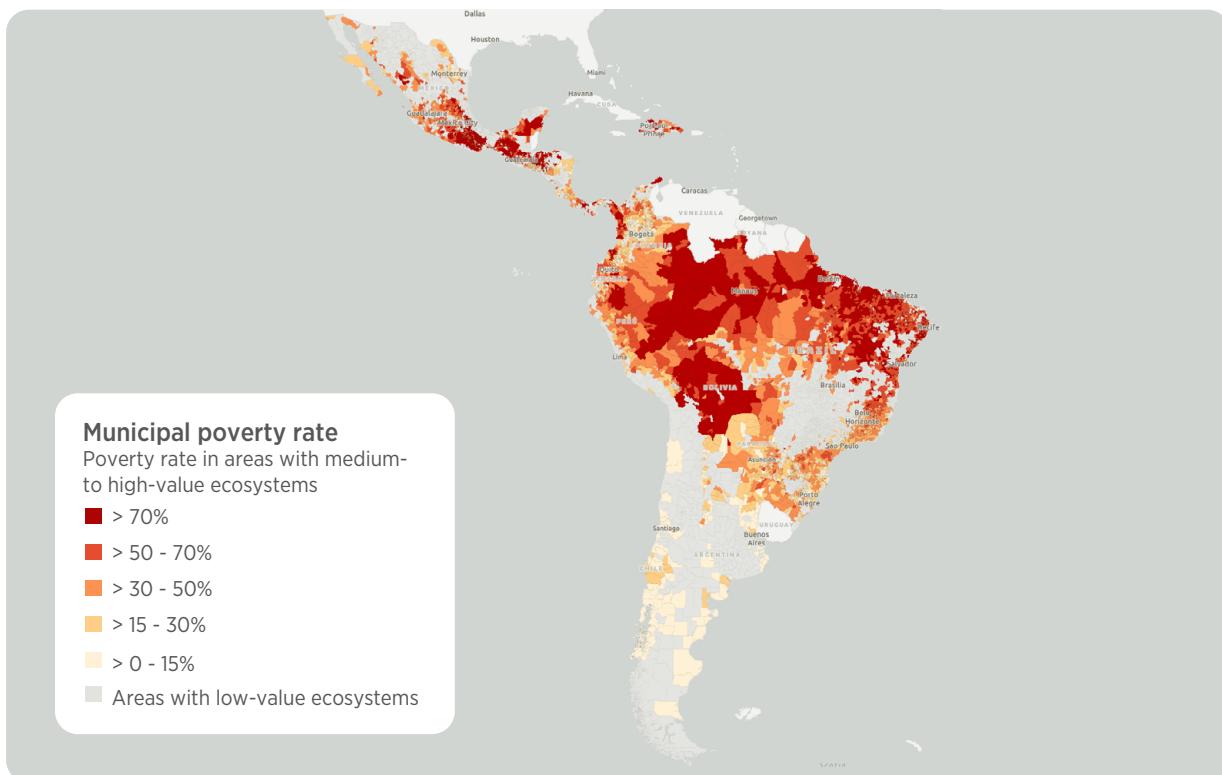
12. World Development Indicator database, World Bank.

largely depends on the quality of the soil, forest and water sources. Land and coastal-marine ecosystems also offer important disaster-reduction services (IDB, 2019), and their degradation increasingly exposes poor households in areas that benefit from coastal habitats such as mangroves and coral reefs; when left undisturbed, these areas reduce the impacts of natural events such as erosion or coastal flooding. Finally, natural capital is a key cultural value, especially for the region's indigenous and afro-descendant populations (IPCC, 2022; Chaplin-Kramer et al., 2022).

Beyond the benefits to the poor, ecosystems provide a service to the entire population. It is estimated that 34 million poor people live near critical natural assets which provide universal benefits to all humanity. The Amazon area alone, for example, provides carbon sequestration and atmospheric humidity recycling that benefit the entire world population, in addition to the benefits (both economic and cultural) it provides to local populations (see Tables A3-A5 in Annex 2).

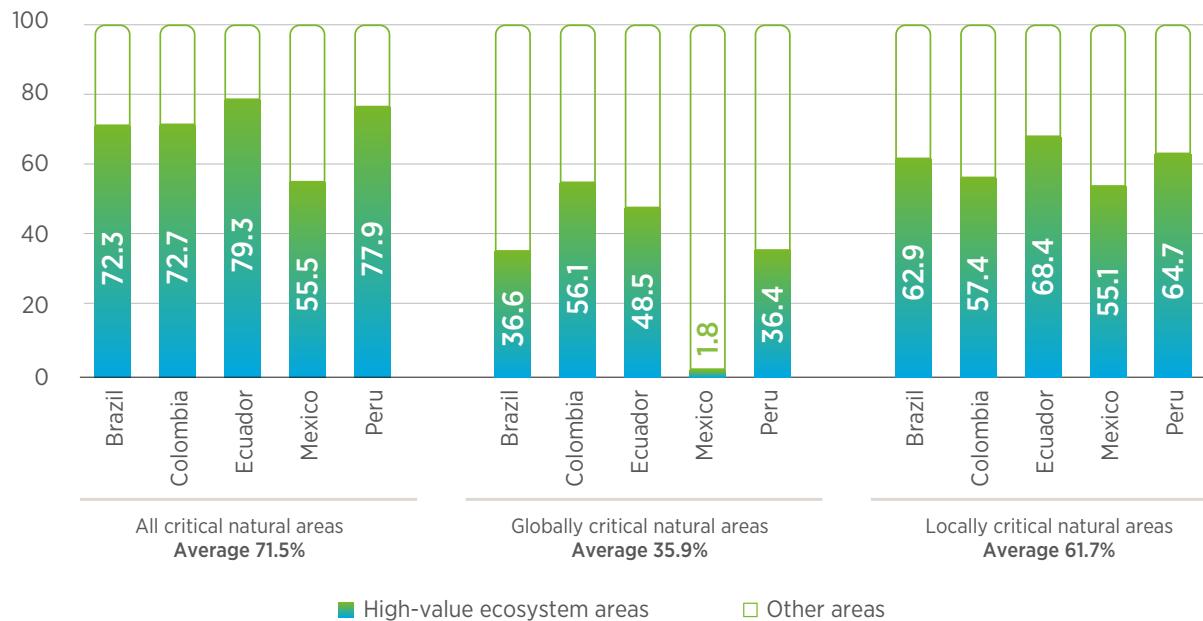


MAP 2 POVERTY RATES IN AREAS OF HIGH ECOSYSTEM VALUE



Source: Prepared by authors based on natural-disaster data from Chaplin-Kramer et al. (2022) and national poverty data (Annex 1, Table A1).

GRAPH 2 PERCENTAGE OF POOR PEOPLE LIVING IN HIGH-VALUE ECOSYSTEM AREAS



Source: Prepared by authors based on Chaplin-Kramer et al. (2022) and poverty data (Table A1).

Note: See Annex 1 for further details.

Policies to decarbonize the economy and their impact on poverty

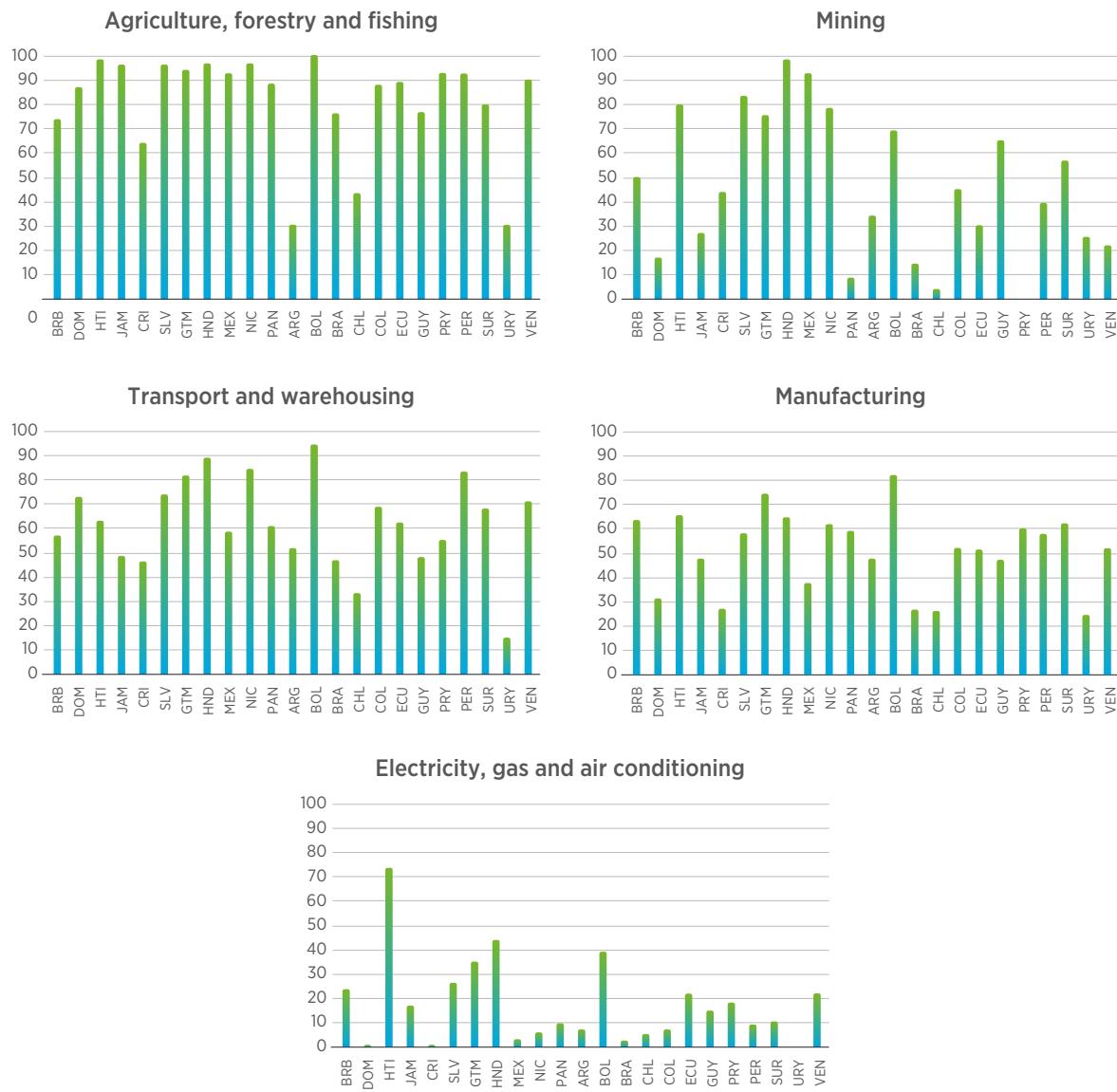
To halt the acceleration of climate change, countries in the region and around the world have agreed on the implementation of decarbonization measures, some of which may have negative social impact. Through the Paris Agreement, the countries of the world—including those of Latin America and the Caribbean—committed to a series of measures to limit the rising global temperature as close as possible to 1.5 °C (United Nations, 2015). Policies to achieve this goal, while required in order to stop greenhouse gas emissions, can have negative social impact on specific populations unless appropriate compensation measures are undertaken (Saget et al., 2020).

Transition away from the most polluting industries can result in loss of jobs and income sources in certain economic sectors. While a solidly positive balance is expected in terms of the creation and loss of jobs resulting from the region's transition to a net-zero-emission economy, 7.5 million jobs could be lost in the most-polluting sectors of the economy (Saget et al., 2020). Not all workers affected by this job loss belong to the poorest sectors

of the population; however, without adequate social protection mechanisms, elimination of income sources can mean higher poverty rates in those groups. Specifically, informal workers—who on average account for 59% of the region's economically active population (ILO, unpublished document)—are not covered against the risk of unemployment by any income-protection mechanism and are therefore particularly vulnerable. This inequality is especially problematic in economic sectors most impacted by the decarbonization measures. For example, in the transport sector, informality rates reach 50% in 17 of the region's countries, and informality in the agricultural sector is 70% in 19 of the region's countries (see Figure 3).

Energy subsidies may be regressive, but their termination can result in a significant rise in prices of basic goods and services. Only one in ten dollars spent on energy subsidies in the region benefit the 20% lowest-income population. However, termination of these subsidies can result in significant increases in the cost of public transportation, food and energy, all of which would affect poor and vulnerable households in particular (Feng et al., 2018), as they are more impacted by the prices of basic goods than more wealthy households. Experiences in the region and across the world have shown that these adverse effects can have negative social impacts, making it difficult to phase out energy subsidies.

GRAPH 3 INFORMALITY IN GREENHOUSE-GAS-EMITTING SECTORS



Source: Prepared by authors based on ILO data (unpublished document).

2 NEW ROLES IN SOCIAL PROTECTION & CLIMATE AGENDA: OPPORTUNITIES AND GAPS

In this section, we define the potential contributions of social protection in addressing the increased frequency and intensity of extreme weather events and disasters, ecosystem degradation and the adverse impacts of decarbonization measures. While there are opportunities for social protection programs in these areas, there are also major challenges and broad gaps in knowledge about the best policy options.

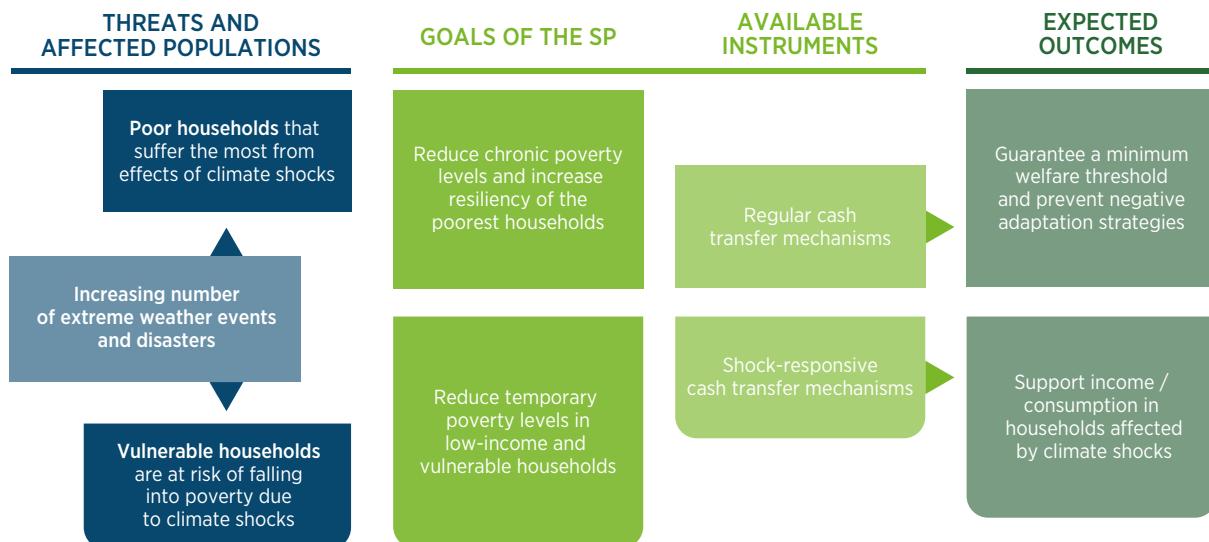
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Cash transfer programs to address the increased frequency and intensity of extreme weather events and disasters

There are two main ways that cash transfers can increase the resiliency of poor and vulnerable households facing extreme weather events and disasters. First, regular cash transfers can play a key role in alleviating chronic poverty¹³ in the region, which helps reduce the vulnerability of these households to climate threats (IPCC, 2022). Second, whenever disasters do occur, social protection systems can support the incomes and consumption of poor and vulnerable households through responsive and promptly activated cash transfer mechanisms that may contain or prevent increases in transitory poverty (see Figure 2).

13. Although cash -transfer programs target households in poverty, the statistical methods used to identify eligible populations and assign benefits -mainly the proxy mean test- often result in programs targeting populations living in chronic poverty. This method can lead to the exclusion of households experiencing temporary poverty because they have not yet faced a reduction in their assets.

FIGURE 2 CASH TRANSFER PROGRAMS TO ADDRESS EXTREME WEATHER EVENTS AND DISASTERS



Source: Prepared by authors.

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Regular cash transfer programs help increase the climate resiliency of the poorest households. The region has pioneered the development of cash transfer programs, and these programs play a key role in alleviating chronic poverty (Ibarrarán et al., 2017). In 2019, regular cash transfer programs reached around 105 million people (Stampini et al., 2021). These programs create minimum income (and occasionally savings) levels that enable better absorption and recovery from shocks, preventing adoption of negative adaptation strategies to cope with extreme weather events and disasters (Bastagli, 2016; Asfaw and Davis, 2018).

Robust evidence –generally based on data from randomized studies– shows the effects of cash transfer programs during climate shock episodes. In Zambia and Niger, evidence shows that unconditional cash transfer programs enabled beneficiary households to begin to save, so when shocks occurred, household members were able to maintain their higher consumption and food security levels in comparison with groups that did not receive cash transfers (Asfaw and Davis, 2018; Taylor et al., 2019; Premand, 2000). Cash transfer programs also reduced adoption of negative adaptation strategies: they reduced child labor, sale of assets, and extreme indebtedness as unfortunate disaster-response strategies (Asfaw and Davis, 2018). Similar effects were seen in LAC countries. Maluccio (2005), for instance, concludes that, in Nicaragua, cash transfers helped support incomes and maintain consumption levels in areas affected by the coffee-price crisis, and also kept children in

school during and after the shock. Evidence in Mexico shows that cash transfer programs through the Progresa Program prevented negative coping strategies from taking hold and in particular helped keep children in school during the occurrence of a series of different shocks (De Janvry et al., 2006).

Coverage of regular cash transfer programs in the region's poorest population groups is still limited, especially in countries with greater climate vulnerability. Despite significant progress in the last decades, cash transfer programs still have significant coverage gaps among the poorest households. Although in most LAC countries, the number of beneficiaries of non-contributive cash transfer programs is equal to or larger than the number of people living in poverty, these programs are imperfect in their targeting (Stampini et al., unpublished document). Cash transfer programs in the region on average reach only 56% of the population living in extreme poverty (Stampini et al., 2021) and the amounts of the cash transfers are usually small (representing around 30% of the poverty gap). This situation leaves millions of poor and vulnerable households without the support needed to achieve a minimum welfare level before the occurrence of climate shocks, limiting their capacity to handle a shock without endangering the family's assets and future welfare. In particular, the countries more vulnerable to climate threats tend to be those with greater coverage gaps in their cash transfer programs. In the four most vulnerable countries to climate threats (El Salvador, Honduras, Dominican Republic and Paraguay), 60% to more than 90% of the population living in poverty remain uncovered by cash transfer programs (see Annex 3).

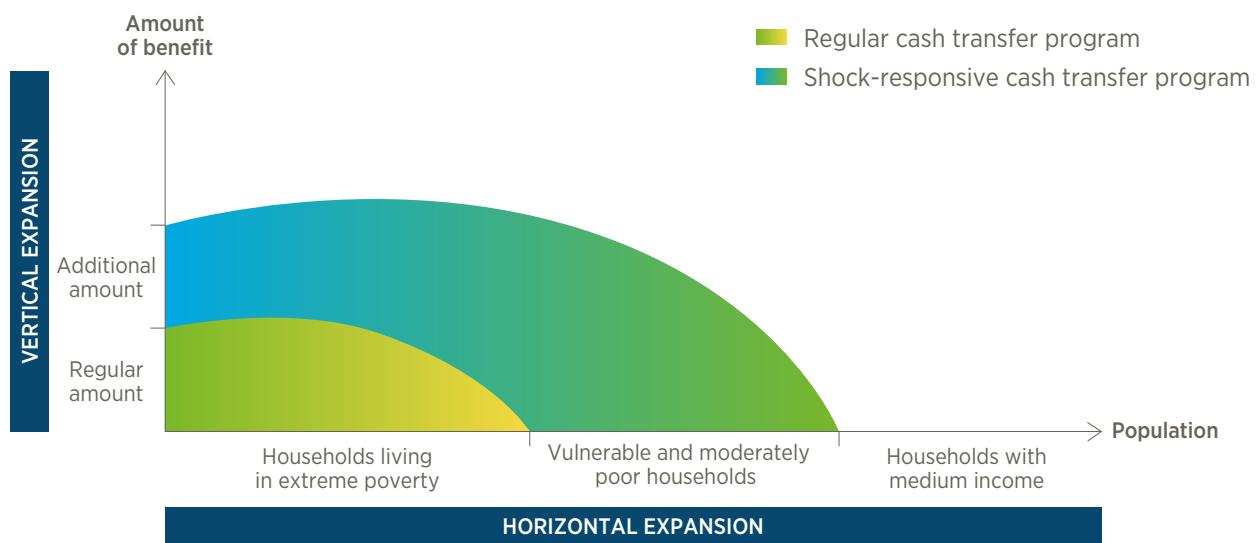
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In addition to their regular cash transfer programs, social protection systems can develop extraordinary cash transfer mechanisms to support households affected by climate shocks. These mechanisms generally consist of non-conditioned cash transfers to support the income and consumption of households affected by extreme weather events and disasters, enabling more rapid recovery. As in the pandemic response, these actions can be directed at both poor households traditionally served by social protection systems and vulnerable households at risk of falling into periods of transitory poverty. Implementation of these mechanisms requires development of new capacities in social protection systems to expand interventions beyond their original scope. In particular, they must develop their capacity to rapidly expand cash transfer programs, both vertically (temporally increasing amounts or duration of cash transfers) and horizontally (extending cash transfer coverage to new populations), as shown in Figure 3.

The evidence, though still limited, suggests these mechanisms can effectively support consumption and income in the households most affected by climate shocks. Using a regression discontinuity design, Mansur et al. (2018) showed that three months after Severe Tropical Cyclone Winston, the probability of special cash transfer beneficiaries having recuperated from the impacts they suffered was higher than it was for households in

the control group. Also using a regression discontinuity design, Gallego et al. (2021) found that special cash transfers as a response to COVID-19 in Colombia supported incomes and increased beneficiaries' spending on education and food consumption, as compared with the control group.

FIGURA 3 HORIZONTAL AND VERTICAL EXPANSION, THE KEY FEATURE OF RESPONSIVE SP SYSTEMS



17
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Source: O'Brien et al. (2018).

Several countries in the region have used mechanisms of this type to address a number of different shocks. For example, El Salvador and Peru added new beneficiaries to existing social protection programs to respond to droughts, hurricanes and torrential rains in 2017 and 2018, respectively (2019). In Mexico, the Oportunidades Program anticipated regular cash transfers to support beneficiaries affected by disasters. Although it was not a climate challenge, the COVID-19 crisis demonstrated the importance of shock-responsive social protection in the region. During the crisis, LAC governments implemented a total of 111 new cash transfer interventions as a response to the shock, increasing average cash transfer coverage from 26% to 34% of the total population (Stampini et al., 2021; Cejudo et al., 2021).

However, experiences using special cash transfers in the region revealed the social protection systems' lack of preparedness to respond to shocks. The interventions were often ad hoc and reactive without a planned and orderly response strategy (Costella et al.,

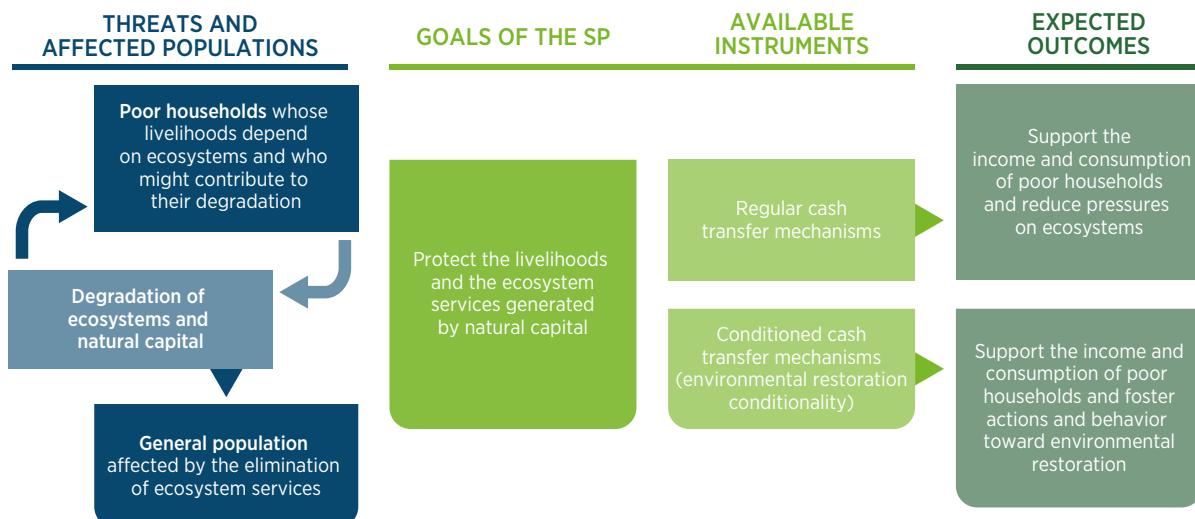
2023). In particular, social protection systems have not set up clear rules to activate contingency cash transfer programs when shocks occur and they lack governance mechanisms to coordinate the actions of the multiple actors involved in preparation for / response to emergencies, such as actors in risk management and disasters, humanitarian aid, and social protection. They also lack contingent financial mechanisms to make resources promptly available and often depend on emergency reallocation of the budget to fund interventions (Williams and Gonzalez, 2020). Finally, very few countries have made progress in adapting their operation systems to allow for shock response. Social registries and social information systems tend to have low coverage; contact information is often out of date and information is rarely available on the exposure and vulnerability of households to new climate threats (Berner and van Hemelryck, 2020). There are also important gaps in payment and benefit delivery mechanisms. The region has advanced significantly toward digital payment methods, but these systems still lack the coverage and capillarity needed for quick and large-scale delivery (Williams and Gonzalez, 2020). As a result of these shortcomings, LAC countries took an average of 60 days to pay the contingency cash transfers in response to the pandemic, counting from the day in which the first lockdown restrictions were implemented (Beazley et al., 2021).

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Contributions of social protection to address degradation of ecosystems and of natural capital

Given the accelerated degradation of ecosystems and persistence of poverty in the region, especially in high-value rural ecosystems, it is clear that the simultaneous challenges of poverty reduction and environmental recovery need to be tackled in a coordinated fashion. Poor and vulnerable populations in rural areas are the main groups targeted by social protection interventions aimed at environmental recovery. The livelihoods of these groups depend more on ecosystems, and these rural workers may sometimes contribute to environmental degradation by overexploiting resources to satisfy their basic needs. At the same time, since the whole population may benefit from the ecosystem services generated by restored environmental assets, the benefits of these interventions may go beyond poor and vulnerable populations. Although the knowledge gaps on best policy options are still important, two main contributions of social protection to tackle environmental degradation stand out (see Figure 4).

**FIGURE 4 CONTRIBUTIONS OF SOCIAL PROTECTION
TO ADDRESS ECOSYSTEM DEGRADATION**



Source: Prepared by authors.

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First, regular cash transfers can help reduce pressures on ecosystems. By providing a minimum flow of reliable income, cash transfers can help poor and vulnerable households reduce their excessive exploitation of natural resources to satisfy their basic needs for subsistence. In Indonesia, Ferraro and Simorangkir (2020) showed that cash transfers are associated with a significant reduction in deforestation due to transfers replacing exploitation of the forest during crises and market-bought goods substituting for goods extracted through exploitation of the forest. In Colombia, Malerba (2020) also found an association between cash transfers and lower deforestation rates since beneficiary households tended to acquire goods in markets instead of exerting pressure on local ecosystems. However, evidence from Mexico also shows that in the context of limited infrastructures and limited access to markets, cash transfers are associated with increased consumption of goods that require intensive land use (milk, beef, etc.) and can thus lead to increased deforestation (Alix-Garcia et al., 2013). More in-depth analysis is needed on the conditions under which regular cash transfers can contribute to ecosystem conservation.

Second, cash transfers can foster practices and behaviors that support restoration of environmental assets. In the region, various payments-for-ecosystem-services (PES) methods are common in countries such as Brazil, Costa Rica, Ecuador and Mexico, but they do not always have the goal of a social protection mechanism. Most of these programs mainly

have an environmental focus and any accompanying reduction in poverty is considered to be a co-benefit (Liu and Kontoleon, 2018). However, there is a growing trend to use cash transfers that target poor communities for environmental restoration. These programs generally condition cash transfer payments on the adoption of practices to protect or restore ecosystems and they seek both goals (poverty reduction and restoration of natural capital).

Different cash transfer models have been used to this end, but little evidence on their effectiveness has been recorded so far. In Brazil, the Bolsa Floresta program made monthly payments for at least two years to households in a protected area in the Amazon, signed a commitment to limit deforestation and adhered to additional sustainable land use practices. The quasi-experimental impact evaluation of Bolsa Floresta (Cisneros et al., 2022) concludes that the program reduced deforestation by 10% and forest degradation by 11%. Effects were greater in areas with stronger pressures on ecosystems, where a 26% reduction in deforestation was achieved. Bolsa Verde is another example of a Brazilian cash transfer program that incorporated environmental conservation goals. The program focused on a group of poor families who were Bolsa Familia beneficiaries and conditioned quarterly payments to comply with a list of activities fostering sustainable management and ecosystem conservation (AFD and ILO, 2019a). The quasi-experimental impact evaluation of Bolsa Verde concludes that the program was cost-effective and reduced deforestation in approximately 80,000 hectares, so 35 megatons less of CO₂ emissions were prevented during the program's execution and there was no evidence of a rebound in forest loss after its end (Costedoat et al., 2022).

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In other regions around the world, cash-for-work programs have had promising social and environmental results. Launched in Ethiopia in 2005, the Productive Safety Net Programme (PSNP) finances cash transfers to poor families based on their participation in work and construction projects focused on conservation of land and water sources and reforestation activities. A quasi-experimental impact evaluation of the program showed that PSNP increased tree coverage by 3.8% from 2005 to 2019 (Hirvonen et al., 2022) and the program's contribution to carbon capture has been estimated at 5.7 tons of CO₂ per hectare per year (Györi et al., 2021). The main public-employment program in India established by the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) has also promoted projects in soil conservation, reforestation and protection against drought, thus contributing to carbon sequestration and poverty reduction (Györi et al., 2021).

Despite recent progress, the regional coverage of these programs is extremely limited, and there are significant gaps in the knowledge about their operation. In Latin America and the Caribbean, cash transfer programs for environmental restoration have had very limited coverage and have not gained ground as sustainable cash transfer mechanisms. For example, the Bolsa Floresta program was implemented between 2008 and 2010 in 15 protected

areas in Amazonia and reached a total of 9,600 families, while the Bolsa Verde program was executed from 2011 to 2018 and reached 80,000 families. In terms of design, there is no systematic evidence on the best alternatives and mechanisms to use in interventions. There is also limited knowledge on the most cost-effective conditionality types, transfer amounts and contractual conditions, and unanswered questions remain about the sustainability of these interventions' results. Finally, these programs do not address the main determinants of environmental degradation (such as the progressive extension of agriculture and livestock farming for international markets) and their absolute effects are still limited (Cisneros et al., 2022; Costedoat et al., 2022). It is therefore highly unlikely that on their own they have had a significant effect on the conservation and restoration of regional natural capital. To boost their impact, their programming should be coordinated with other existing conservation interventions in the region, such as payments for environmental services.

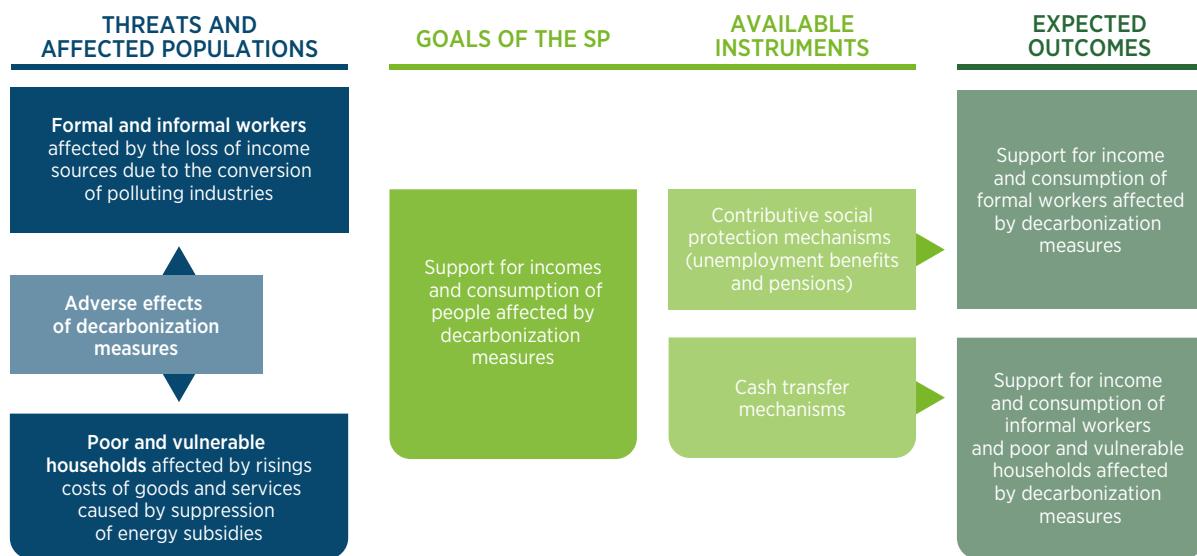
Contributions of social protection to address the adverse effects of decarbonization measures

To address the adverse effects of decarbonization measures on the countries' economies, social protection programs can help protect the income and consumption levels of poor and vulnerable households. Social protection programs can support two population groups in particular: formal or informal workers in economic sectors directly or indirectly affected by decarbonization measures and poor and vulnerable households in which consumption levels might be affected by price increases caused by the elimination of energy subsidies (see Figure 5). To this end, social protection systems can draw on the combination of two main instruments: contributive income-support mechanisms (such as unemployment benefits and pensions) and non-contributive mechanisms (such as cash transfers).

Different contributive and non-contributive social protection instruments can be used to protect the income of people affected by the closing of polluting industries. Unemployment benefits and anticipated pensions for people close to their retirement ages can be effective compensation instruments for workers in the formal sector and thus covered by these mechanisms. In turn, non-contributive cash transfers can be used to protect the income and consumption of informal workers who are not covered by contributive compensation programs (AFD and ILO, 2019b). These compensation measures can be combined with active labor market policies toward the retraining and labor reconversion of affected persons.¹⁴

¹⁴. Interventions related to employment policies are analyzed in another position document to be published soon (IADB, unpublished document).

FIGURE 5 CONTRIBUTION OF SOCIAL PROTECTION TO ADDRESS THE ADVERSE EFFECTS OF DECARBONIZATION MEASURES



Source: Prepared by authors.

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We have yet to identify any experience of fossil-fuel-industry conversion in the LAC region that has been documented and evaluated. However, experiences in other regions indicate that the combination of these social protection instruments can help mitigate the negative effects of decarbonization measures. In Romania, for example, compensation measures via cash transfers were combined with different support mechanisms (job incentives, job training and micro-credit programs) to compensate for the adverse effects resulting from the closing of a mine. The project supported the creation of over 13,000 jobs, and in the beneficiary communities, close to half of those affected by the closing of the mines found other sources of employment (Rigolini, 2021). In China, a forest conservation program led to the elimination of the income sources of nearly one million public forestry workers and 120 million rural households were affected by the conservation measures. To compensate for these adverse effects, public employees were provided with job intermediation and placement services, as well as unemployment benefits and anticipated pension mechanisms. In turn, local communities affected by the conservation measures benefited from consumption subsidies and cash transfer mechanisms conditioned to environmental conservation activities. As a result of the compensation plan, two thirds of the affected workers were transferred to other positions within the public forestry sector, or placed in jobs in other economic sectors, or retired; and 124 million people benefited from the cash transfer mechanisms and consumption subsidy (AFD and ILO, 2019b).

Contributive programs in the region have large coverage gaps, which can limit their use in just transition processes. The majority of workers work in the informal sector, and even those in the formal sector, have extremely limited access to income-protection contributive instruments. In Latin America and the Caribbean, few countries have unemployment benefits, and where they do exist, their coverage is still minimal. In Brazil, the country with the highest coverage in the region, only 13% of the unemployed receive unemployment benefits, whereas coverage in Argentina, Chile and Uruguay ranges from 2% to 6% of the unemployed, compared to 26% in the United States or 40% in Canada (Alaimo et al., 2015). In turn, only 45 out of 100 workers in the region on average are contributing or enrolled in a pension plan (Aranco et al., 2022; OECD, IDB and World Bank, 2015). This limits the use of mechanisms widely used in other global regions to compensate for the effects of de-carbonization measures, such as extending unemployment benefits during periods of labor job transition or anticipated pensions for formal workers close to their retirement age.

Cash transfers can be used to limit the negative impact of terminating fossil-fuel subsidies. For example, elimination of a subsidy available to Dominican households using natural gas led to the creation of the Bono Gas Hogar transfer. This intervention was based on the existing cash transfer program and its purpose was to protect the poorest families from termination of the subsidies. Use of the unified beneficiary system (the Dominican social registry) helped target transfers to the poorest households (Ibarrarán et al., 2017). In 2014, Honduras implemented a comprehensive fiscal reform that included a reduction of energy subsidies, and as part of the reform, a special fund allocating resources for social protection programs was created (IDB, 2021). However, these experiences do not appear to have been carefully documented and we have not been able to identify rigorous impact evaluations. Still, evidence in the region shows there is an important opportunity to better coordinate subsidy reform with cash transfer programs. For example, it is estimated that in 11 LAC countries, only 19% of the income generated by a tax on gasoline or 21% of the income generated by electricity price reform would generate enough resources to compensate households in the two bottom population quintiles through cash transfer programs. Compensation through cash transfers is also associated with wider social acceptance of reforms (Feng et al., 2018).

3 THE RESPONSE: ADAPT SOCIAL PROTECTION SYSTEMS TO THE CHALLENGES OF CLIMATE-CHANGE

Although important opportunities exist in the three areas mentioned in this document, the countries' social protection and climate-change agendas remain disconnected. The countries shape their climate-change mitigation and adaptation strategies in their Nationally Determined Contributions (NDCs) and their National Adaptation Plans (NAPs). Each country's NDC sets the specifics of the country's effort to reduce national emissions and adapt to the effects of climate change, while the NAP identifies the country's medium- and long-term adaptation requirements and outlines the strategies and programs to address them. These strategies rarely mention the contributions of social protection in confronting new climate threats and the role of social protection in supporting the poorest and most vulnerable households. At the same time, the region's social protection programs still lack the policies and strategies, the financing and governance mechanisms, and the operational instruments needed to coordinate poverty-reduction actions with the climate agenda.

This section proposes a series of alternatives to adapt social protection systems and move toward greater integration between the poverty-reduction agenda and the response to climate-change. For each of the action areas analyzed, a series of actions are proposed to strengthen the strategic and operational integration between the social protection and climate change agendas in terms of: i) financing; ii) governance; iii) instruments and programs; and iv) operational mechanisms (Table 1).



Strengthen the contributions of social protection given the increased intensity and frequency of extreme weather events and disasters

In terms of financing, adequate budget levels must be ensured for regular cash transfer programs and new financing mechanisms put in place for shock-responsive cash transfer programs. To attain the budget level required for maintaining satisfactory coverage levels of regular cash transfer programs will require exploring ways to increase domestic revenue collection; for example, by reducing generalized subsidies (including energy subsidies) and tax exemptions and generating greater efficiency in social expenditure by reducing leaks in social protection programs. In turn, contingency funds or catastrophic insurance mechanisms that can be rapidly activated during emergencies are needed to allow for an agile and planned response to extreme weather events and disasters.

In terms of governance, regulatory frameworks, processes and procedures are needed to enable a planned and orderly implementation of shock and disaster responses. In particular, the roles and responsibilities of social protection actors in shock response and in activation of disaster response extraordinary cash transfer programs must be clearly specified. Governance frameworks should define the mechanisms for the articulation and coordination with risk and disaster management actors and humanitarian aid actors involved in shock response interventions.

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In terms of instruments and programs, it is important to ensure adequate coverage of regular cash transfers for vulnerable households exposed to climate hazards and to strengthen shock responsive cash transfer mechanisms. In the majority of LAC countries,¹⁵ cash transfer programs are extensive enough to serve poor households. However, cash transfers should more effectively target the poorest households, especially in areas most vulnerable to climate shocks. The criteria for vertical and horizontal expansion of the programs should also be defined. In particular, the following provisions should all be defined ex ante: the rules and criteria that trigger extraordinary cash transfers, the criteria used to determine beneficiary groups, the amount and duration of transfers, the circumstances under which the program's conditions can be suspended, and the mechanisms used to make emergency transfers.

Operating mechanisms need to be strengthened and adapted, including social-information systems, targeting mechanisms and payment-transfer mechanisms. Given the nature of climate shocks, it is essential to expand the coverage of social registries be-

¹⁵. Except in Honduras, El Salvador and Guatemala, where the scale of cash transfer programs is insufficient to serve the population in poverty.

yond the traditional beneficiary group of social protection programs (households in poverty); vulnerable populations and other categories of the at-risk population should also be included. To that end, programs will need mechanisms to actively search for beneficiaries, especially within the population living in chronic poverty (often more difficult to include in cash transfer programs). It is also important to integrate the socioeconomic information of social registries with other information sources related to the exposure of households to natural threats and ensure ongoing information updates. The mechanisms to identify and select beneficiaries, initially created to target interventions for households in poverty, should also be adapted to identify vulnerable households that may fall into transitory poverty due to shocks. Finally, to guarantee prompt delivery of support in emergency contexts, the coverage and capillarity of cash transfer payment mechanisms must be expanded with the best possible combination of digital and face-to-face payments.

Strengthen the contributions of social protection in light of the degradation of ecosystems and natural capital

With respect to financing, closer coordination is needed with existing national and international climate funds for ecosystem conservation and restoration. Several LAC countries and international organizations have created environmental conservation and restoration funds. These funds have the potential to finance the implementation of innovative social protection interventions that contribute to environmental restoration in the future. They can provide financing options, especially to implement pilot programs and generate evidence on the best policy options. Additionally, if environmental conditionalities were included in existing cash transfer programs, the budgets allocated to these programs could contribute directly to the country's environmental conservation and restoration goals. It is important to ensure the budgetary sustainability of these programs through the actions detailed in the previous section.

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In terms of governance, there is an opportunity to create new connections and coordination with environmental, natural resource and agricultural regulatory agencies. The technical contributions of these stakeholders are needed to ensure technical and operational quality in design / supervision / evaluation of the interventions, as well as to search for stronger synergies between sectors and avoid duplications or isolated actions. In particular, close coordination is needed between the teams in charge of rural social protection programs and the teams and actors in charge of implementing conservation / environmental restoration / natural-resource management programs, especially when opportunities arise to implement joint actions in rural areas with extreme poverty.

In terms of instruments and programs, innovative pilot projects with the dual purpose of poverty reduction and environmental restoration should be conducted and evaluated.

Given the region's limited experience in this area, more and better evidence still needs to be generated on the type of conditionalities needed to promote environmental restoration and the type of benefits needed (i.e., cash transfers, technical assistance, transfer of assets) to achieve sustainability of program goals. Rigorously evaluated pilot interventions can be an appropriate strategy to close knowledge gaps and build the technical capacities needed to implement these programs.

The pilot implementation of these programs also required the development and testing of new operating mechanisms. In particular, it is important to design and test mechanisms to identify geographical areas with high-value ecosystems at risk of degradation, prioritize environmental assets to be restored, and identify and select poor and vulnerable households or communities in these areas. In this sense, there is a great opportunity to cross-reference social-registry data with the information available on the state of ecosystems and natural capital in the region. Finally, new mechanisms for measuring intervention results (both social and environmental) must be developed.

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Strengthen social protection measures in response to effects of decarbonization measures

In financial terms, elimination of energy subsidies could help generate the resources needed to implement compensatory measures. The financing of social protection measures needed to offset increases in the costs of goods and services resulting from the elimination of subsidies can be accomplished by using a portion of the fiscal savings generated by the subsidy elimination. Moving toward these finance mechanisms would result in the environmental benefits associated with elimination of energy subsidies and, at the same time, generate enough resources to temporarily extend cash transfer programs.

In terms of governance, the opportunity has opened for social protection representatives to strengthen their participation in defining just transition strategies. Reforms associated with decarbonization measures are often made regardless of their impact on poverty and they can lead to strong social discontent if proper compensation measures are not adopted. Just transition strategies are essential -- strategies that maximize the benefits of the reforms and reduce their adverse effects on poor and vulnerable households. These strategies should be developed jointly with the ministries of economy and finance, ministries of labor and other stakeholders involved in designing and implementing decarbonization measures at the national level. These strategies should determine necessary compensatory measures beforehand and clearly communicate the implementation schedule to the population.



With respect to instruments and programs, compensations should be defined to counter the adverse effects of decarbonization measures. Given the existing gaps in contributive social protection mechanisms in the region, LAC countries face the challenge of identifying the best possible combination of contributive and non-contributive instruments to compensate for the adverse effects of decarbonization measures. For the compensation of formal and informal workers affected by transition away from polluting industries, social protection measures could be complemented by active labor market policies that support access to new income sources.

With respect to operating mechanisms, social protection systems must have the information and mechanisms needed to deliver the benefits. People affected by decarbonization measures, many of them from vulnerable households affected by rising costs of goods and services, are not necessarily part of any group traditionally targeted by the social protection systems. Just as with responses to shock, implementation of compensation measures also requires expanding coverage of the social-information systems and payment mechanisms to vulnerable populations and those at risk of falling into poverty.

TABLE 1 SUMMARY OF THE KEY POLICY OPTIONS

	Strengthen social protection contributions in the face of increased intensity and frequency of extreme weather events and disasters	Strengthen social protection contributions against the degradation of ecosystems and natural capital	Strengthen social protection contributions against the adverse effects of measures to decarbonize economies
Financing	Ensure adequate budget levels to implement regular cash transfer programs. Develop contingent financing mechanisms for shock response.	Finance innovative social protection interventions through existing national and international climate funds for ecosystem conservation and restoration.	Finance compensation measures through fiscal savings generated by the elimination of energy subsidies.
Governance	Develop shock response regulatory strategies and set up new inter-institutional articulation mechanisms with the different actors involved, such as risk management and disaster and humanitarian aid actors.	Create coordination entities with environmental / natural resource / agriculture management agencies to plan, design and execute interventions aimed at ecosystems restoration.	Strengthen participation of social protection stakeholders in defining fair transition strategies, along with the ministries of economy and finances, ministries of labor and other stakeholders.
Instruments and programs	Continue to expand the coverage of regular cash transfer programs among the poorest households, especially those in areas of high climate vulnerability. Strengthen shock-responsive cash transfer mechanisms, defining rules for vertical and horizontal expansion of programs.	Pilot and evaluate innovative social protection interventions with the dual objective of reducing poverty and contributing to environmental restoration.	Define the compensation measures necessary to mitigate the adverse effects of decarbonization measures, through the best possible combination of contributive and non-contributive social protection instruments.
Operational mechanisms	Strengthen social information systems. Adapt program targeting mechanisms. Strengthen cash transfer payment mechanisms.	Develop and test mechanisms to target, identify and select beneficiaries and intervention areas. Develop and test mechanisms for program monitoring and evaluation.	Strengthen social information systems. Strengthen cash transfer payment mechanisms.

Source: Prepared by authors.

REFERENCES

- AAFD (French Development Agency) and ILO (International Labor Organization), 2019a. "Social Protection and Climate Change: Can Brazil pursue twin social and environmental objectives together?" <https://www.unclearn.org/wp-content/uploads/library/53574.pdf>.
- AFD (French Development Agency) and ILO (International Labor Organization), 2019b. "Social Protection and Climate Change: How are rural workers and residents in China faring with conservation efforts?" <https://www.socialprotection.org/gimi/ResourcePDF.action?id=53571>.
- Alaimo, V., M. Bosch, D. S. Kaplan, C. Pagés and L. Ripani, 2015. "Jobs for Growth." Washington, DC: Inter-American Development Bank. <https://publications.iadb.org/en/jobs-growth>.
- Alix-Garcia, J., C. McIntosh, K. R. E. Sims and J. R. Welch, 2013. "The Ecological Footprint of Poverty Alleviation: Evidence from Mexico's Oportunidades Program." Review of Economics and Statistics, 95(2), 417-435. https://doi.org/10.1162/REST_a_00349.
- Almond, R.E.A., M. Grooten and T. Petersen, 2020. "Living Planet Report 2020: Bending the Curve of Biodiversity Loss." Gland: World Wildlife Fund (WWF). <https://www.zsl.org/sites/default/files/LPR%202020%20Full%20report.pdf>.
- Arango, N., M. Bosch, M. Stampini, O. Azuara, L. Goyeneche, P. Ibarrarán, D. Oliveira, M. R. Retana and E. Torres Ramírez, 2022. "Aging in Latin America and the Caribbean: Social Protection and Quality of Life of Older Persons." Washington, DC: Inter-American Development Bank. <https://doi.org/10.18235/0004287>.
- Asfaw, S. and B. Davis, 2018. "The Impact of Cash Transfer Programs in Building Resilience: Insight from African Countries. Boosting Growth to End Hunger by 2025, 53-70."
- Báez, J. E. and A. Mason, 2008. "Dealing with Climate Change: Household Risk Management and Adaptation in Latin America." https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1320666.
- Bastagli, F., J. Hagen-Zanker, L. Harman, V. Barca, G. Sturge, T. Schmidt and L. Pellerano, 2016. "Cash transfers: what does the evidence say? A rigorous review of program impacts and the role of design and implementation features." London: Overseas Development Institute. <https://odi.org/en/publications/cash-transfers-what-does-the-evidence-say-a-rigorous-review-of-impacts-and-the-role-of-design-and-implementation-features>.

Bastagli, F., J. Hagen-Zanker, L. Harman, V. Barca, G. Sturge and T. Schmidt, 2019. "The Impact of Cash Transfers: A Review of the Evidence from Low- and Middle-income Countries." *Journal of Social Policy*, 48(3), 569-594. <https://doi.org/10.1017/S0047279418000715>.

Beazley, R., A. Solorzano and V. Barca, 2019. "Study on Shock-Responsive Social Protection in Latin America and the Caribbean: Summary of key findings and policy recommendations." Oxford Policy Management and World Food Programme. https://www.opml.co.uk/files/Publications/a1537-shock-responsive-social_protection-latin-america-caribbean/summary-of-key-findings-and-policy-recommendations.pdf?noredirect=1.

Beazley, R., M. Marzi and R. Steller, 2021b. "Drivers of Timely and Large-Scale Cash Responses to COVID-19: What does the data say?" Social Protection Approaches to COVID-19 Expert Advice Service (SPACE), p. 35. DAI Global UK Ltd. https://socialprotection.org/sites/default/files/publications_files/SPACE_Drivers%20of%20Timely%20and%20Large%20Scale%20_Cash%20Responses%20to%20COVID_19%20%281%29.pdf.

IADB (Inter-American Development Bank), 2018. "Environment and Biodiversity Sector Framework Document." <https://www.iadb.org/document.cfm?id=EZSHARE-76080015-11>.

IADB (Inter-American Development Bank), 2021. "Social Protection and Poverty Sector Framework Document 2021." <https://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=EZSHARE-990561794-9>.

Busso, M. and J. Messina, (Eds.), 2020. "The Inequality Crisis: Latin America and the Caribbean at the Crossroads." Washington, DC: Inter-American Development Bank. <http://dx.doi.org/10.18235/0002629>.

Casas, M., (2017). "La transversalización del enfoque de género en las políticas públicas frente al cambio climático en América Latina." Santiago de Chile: Economic Commission for Latin America and the Caribbean. <https://www.cepal.org/es/publicaciones/41101-la-transversalizacion-enfoque-genero-politicas-publicas-frente-al-cambio>.

Cejudo, G., P. De los Cobos, C. Michel and D. Ramírez, 2021. "Inventario y caracterización de los programas de apoyo al ingreso en América Latina y el Caribe frente a COVID-19." IADB Technical Note No. 02334. Washington, DC: Inter-American Development Bank. <http://dx.doi.org/10.18235/0003840>.

ECLAC (Economic Commission for Latin America and the Caribbean), 2022. "Social Panorama of Latin America 2021." Santiago de Chile: Economic Commission for Latin America and the Caribbean. <https://repositorio.cepal.org/handle/11362/47719>.

Chaplin-Kramer, R., R. A. Neugarten, R. P. Sharp, P. M. Collins, S. Polasky, D. Hole, R. Schuster, M. Strimas-Mackey, M. Mulligan, C. Brandon, S. Diaz, E. Fluet-Chouinard, L. Gorenflo, J. A. Johnson, C. M. Kennedy, P. W. Keys, K. Longley-Wood, P. B. McIntyre, M. Noon and R. A. Watson, 2020. "Mapping the planet's critical natural assets." <https://doi.org/10.1101/2020.11.08.361014>.

Cisneros, E., J. Börner, S. Pagiola and S. Wunder, 2022. "Impacts of conservation incentives in protected areas: The case of Bolsa Floresta, Brazil." Journal of Environmental Economics and Management, 111, 102572. <https://www.cifor.org/knowledge/publication/8291>.

Costedoat, S., A. Pfaff, B. Coutinho and M. Mascia, 2022. "Cost-effective climate mitigation via conservation incentives targeting poverty: Bolsa Verde's impact in Brazilian Amazonia settlements." <https://doi.org/10.21203/rs.3.rs-2122112/v1>.

Costella, C., A. McCord, M. Van Aalst, R. Holmes, J. Ammoun and V. Barca, 2021. "Protección social y cambio climático: aumentar la ambición."

Costella, C., M. Van Aalst, Y. Georgiadou, R. Slater, R. Reilly, A. McCord, R. Holmes, J. Ammoun and V. Barca (under revision). "Can Social Protection Tackle Risks Emerging from Climate Change, and How? A Framework and a Critical Review." <https://dx.doi.org/10.2139/ssrn.4206401>.

Costella, C., A. Díez and R. Beazley, 2023. "Shock-responsive social protection and climate shocks in Latin America and the Caribbean: Lessons from COVID-19." Washington, DC: Inter-American Development Bank. <https://publications.iadb.org/en/shock-responsive-social-protection-and-climate-shocks-latin-america-and-caribbean-lessons-covid-19>.

Dabla-Norris, E., Y. Deng, A. Ivanova, I. Karpowicz, D.F. Unsal, E. VanLeemput and J. Wong, 2015. "Financial Inclusion: Zooming in on Latin America." Washington, DC: International Monetary Fund. <https://ssrn.com/abstract=2696064>.

De Janvry, A., F. Finan, E. Sadoulet and R. Vakis, 2006. "Can conditional cash transfer programs serve as safety nets in keeping children at school and from working when exposed to shocks?" Journal of Development Economics, 79(2), 349-373. <https://doi.org/10.1016/j.jdeveco.2006.01.013>.

Diéguez, J., 2015. "Mapas de Pobreza y Desigualdad a Nivel de Distrito y Corregimiento. Encuesta de Propósitos Múltiples de 2011 y Censo de Población y Vivienda de 2010." Ciudad de Panamá: Ministerio de Economía y Finanzas en Panamá. <https://www.mef.gob.pa/wp-content/uploads/2020/12/Mapas-de-pobreza-y-desigualdad-a-nivel-de-distrito-y-corregimiento-Marzo-2011.pdf>.



FAO (Food and Agriculture Organization of the United Nations), 2016a. "State of the World's Forests 2016. Forests and agriculture: land use challenges and opportunities." Rome: Food and Agriculture Organization of the United Nations. <http://www.fao.org/3/i5588e/i5588e.pdf>.

FAO (Food and Agriculture Organization of the United Nations), 2016b. "Social Protection in the Sahel and West Africa. Strengthening Resilience for Food Security and Nutrition." Rome: Food and Agriculture Organization of the United Nations <https://www.fao.org/documents/card/es/c/18490fdb-05d8-4882-ad1e-c03600b2427d>.

Feng, K., K. Hubacek, Y. Liu, E. Marchán and A. Vogt-Schilb, 2018. "Managing the distributional effects of energy taxes and subsidy removal in Latin America and the Caribbean." Washington, DC: Inter-American Development Bank. <http://dx.doi.org/10.18235/0001331>.

Feres, J. C. and X. Mancero, 2001. "El método de las necesidades básicas insatisfechas (NBI) y sus aplicaciones en América Latina." Santiago de Chile: Economic Commission for Latin America and the Caribbean. <https://repositorio.cepal.org/handle/11362/4784>.

Ferraro, P. J. and R. Simorangkir, 2020. "Conditional cash transfers to alleviate poverty also reduced deforestation in Indonesia." Science Advances, 6(24). <https://doi.org/10.1126/sciadv.aaz1298>.

33

.

Gallego, J., B. Hoffmann, P. Ibarrarán, M. P. Medina, C. Pecha, O. Romero, M. Stampini, D. Vargas, D and D. A. Vera-Cossio, 2021. "Impactos del programa Ingreso Solidario frente a la crisis del COVID-19 en Colombia." Washington DC: Inter-American Development Bank. <http://dx.doi.org/10.18235/0003261>.

Györi, M., K. Diekmann and K. Kühne, 2021. "The Importance of Social Protection for Climate Change Mitigation in LMICs: Success Stories and Opportunities For The Future." Bonn: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). https://socialprotection.org/sites/default/files/publications_files/GIZ_Social_Protection_CCM_LMICs.pdf.

Hallegatte, S., A. Vogt-Schilb, M. Bangalore and J. Rozenberg, 2016. "Unbreakable: building the resilience of the poor in the face of natural disasters." Washington, DC: World Bank. <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/512241480487839624/unbreakable-building-the-resilience-of-the-poor-in-the-face-of-natural-disasters>.

Hallegatte, S. and J. Rozenberg, 2017. "Climate change through a poverty lens." Nature Climate Change, 7(4), 250-256. <https://doi.org/10.1038/nclimate3253>.



Ibarrarán, P., N. Medellín, F. Regalia, M. Stampini, S. Parodi, I. Tejerina, P. Cueva and M. Vásquez, 2017. "How Conditional Cash Transfers Work. Good Practices after 20 Years of Implementation." Washington, DC: Inter-American Development Bank. <https://publications.iadb.org/publications/english/document/How-Conditional-Cash-transfers-Work.pdf>.

Instituto Nacional de Estadística y Banco Mundial, 2013. "Mapas de pobreza rural en Guatemala 2011: Resumen Ejecutivo." <https://www.ine.gob.gt/sistema/uploads/2014/01/10/ifRRpEnf-OcjUfRZGhyXD7RQjf7EQH2Er.pdf>.

IPCC (Intergovernmental Panel on Climate Change), 2014. "AR5 Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change." <https://www.ipcc.ch/report/ar5/wg2>.

IPCC (Intergovernmental Panel on Climate Change), 2022. "Climate Change 2022: Impacts, Adaptation and Vulnerability." H.-O. Pörtner, D. C. Roberts, M. Tignor, E. S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem and B. Rama (eds.). Cambridge and New York, NY: Cambridge University Press. <http://doi:10.1017/9781009325844>.

Jafino, B. A., B. Walsh, J. Rozenberg and S. Hallegatte, 2020. "Revised Estimates of the Impact of Climate Change on Extreme Poverty by 2030." Washington, DC: World Bank. <https://openknowledge.worldbank.org/handle/10986/34555>.

Liu, Z. and A. Kontoleon. 2018. "Meta-Analysis of Livelihood Impacts of Payments for Environmental Services Programmes in Developing Countries." Ecological Economics, 149, 48-61. <https://doi.org/10.1016/j.ecolecon.2018.02.008>.

Malerba, D., 2020. "Poverty alleviation and local environmental degradation: An empirical analysis in Colombia." World Development, 127, 104776. <https://doi.org/10.1016/j.worlddev.2019.104776>.

Mansur, A., J. Doyle and O. Ivaschenko, 2018. "Cash Transfers for Disaster Response: Lessons from Tropical Cyclone Winston." Development Policy Centre Discussion Paper, (67). <https://reliefweb.int/report/fiji/cash-transfers-disaster-response-lessons-tropical-cyclone-winston>.

Morris, S. S., O. Neidecker-Gonzales, C. Carletto, M. Munguía, J. M. Medina and Q. Wodon, 2002. "Hurricane Mitch and the Livelihoods of the Rural Poor in Honduras." World Development, 30(1), 49-60. [https://doi.org/10.1016/S0305-750X\(01\)00091-2](https://doi.org/10.1016/S0305-750X(01)00091-2).

United Nations, 2015. "United Nations Framework Convention on Climate Change (UNFCCC)." <https://www.refworld.org.es/docid/602021b64.html>.

Nazrul Islam, S. and J. Winkel, 2017. "Climate Change and Social Inequality." DESA Working Paper 152, New York: United Nations Department of Economic & Social Affairs. https://www.un.org/esa/desa/papers/2017/wp152_2017.pdf.

Neumayer, E. and T. Plümper, 2007. "The gendered nature of natural disasters: The impact of catastrophic events on the gender gap in life expectancy, 1981–2002." Annals of the Association of American Geographers, 97(3), 551-566.

O'Brien, C., R. Holmes, Z. Scott and V. Barca, 2018. "Conjunto de herramientas para sistemas de protección social reactivos ante emergencias. Evaluar el uso de la protección social para hacer frente a crisis de gran escala."

O'Brien, C., Z. Scott, G. Smith, V. Barca, A. Kardan, R. Holmes, C. Watson and J. Congrave, 2018. "Shock-Responsive Social Protection Systems Research: Synthesis Report." Oxford: Oxford Policy Management. <https://www.opml.co.uk/files/Publications/a0408-shock-responsive-social-protection-systems/srsp-synthesis-report.pdf>.

OECD (Organization for Economic Co-operation and Development), IADB (Inter-American Development Bank) and World Bank, 2015. "Panorama de las Pensiones: América Latina y el Caribe." Washington, DC: Inter-American Development Bank. <https://publications.iadb.org/es/panorama-de-las-pensiones-america-latina-y-el-caribe>.

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ILO (International Labor Organization), 2023. "Women and men in the informal economy: A statistical update." Unpublished document.

UNEP (United Nations Environment Program), 2009. "Mainstreaming Poverty Environment Linkages into Development Planning: A Handbook for Practitioners." Nairobi: United Nations Development Program and United Nations Environment Program. <https://www.unep.org/sites/g/files/zskgke326/files/publications/Mainstreaming%20Poverty-Environment%20Linkages%20into%20Development%20Planning.pdf>.

Pokhriyal, N., O. Zambrano, J. Linares and H. Hernández, 2020. "Estimating and Forecasting Income Poverty and Inequality in Haiti using Satellite Imagery and Mobile Phone Data." Washington, DC: Inter-American Development Bank. <https://doi.org/10.18235/0002466>.

Rigolini, J., 2021. "Social Protection and Labor: A Key Enabler for Climate Change Adaptation and Mitigation." Discussion Paper No. 2108. Washington, DC: World Bank. https://documents1.worldbank.org/curated/en/356911638776148708/pdf/Social_protection-and-Labor-A-Key-Enabler-for-Climate-Change-Adaptation-and-Mitigation.pdf.

Saget, C., A. Vogt-Schilb and T. Luu, 2020. "Jobs in a net-zero emissions future in Latin America and the Caribbean." Washington, DC: Inter-American Development Bank. <https://publications.iadb.org/publications/english/document/Jobs-in-a-Net-Zero-Emissions-Future-in-Latin-America-and-the-Caribbean.pdf>.

Stampini, M., P. Ibarrarán, C. Rivas and M. Robles, 2021. "Adaptive, but Not by Design: Cash Transfers in Latin America and the Caribbean Before, During and After the COVID-19 Pandemic." IADB Technical Note No. 2346. Washington, DC: Inter-American Development Bank. <https://doi.org/10.18235/0003795>.

Stampini, M., N. Medellín and P. Ibarrarán. Unpublished document. "Cash transfers, poverty and inequality in Latin America and the Caribbean." Washington, DC: Inter-American Development Bank.

UNFPA (United Nations Population Fund), 2012. "Gender-based Violence and Natural Disasters in Latin America and the Caribbean." <https://lac.unfpa.org/sites/default/files/pub-pdf/UNFPA%20version%20ingles%201.pdf>.

Vollenweider, X., C. Bosco, R. Sánchez and L. Tejerina, 2019. "High-resolution spatial modeling of population welfare in El Salvador, a coding tutorial." Washington, DC: Inter-American Development Bank. <https://el-bid.github.io/tutorial-spatial-modelling-population-welfare-SCL-SPH/>.

Williams, A. M. and S. B. Gonzalez, 2020. "Towards Adaptive Social Protection Systems in Latin America and the Caribbean: A Synthesis Note on using Social Protection to Mitigate and Respond to Disaster Risk." Washington, DC: World Bank. http://documents.worldbank.org/curated/en/381821593592889887/Towards-Adaptive-Social-protection-Systems-in-Latin-America-and-the-Caribbean-A-Synthesis-Note-on-Using-Social_protection-to-Mitigate-and-Respond-to-Disaster-Risk.

ANNEX 1. DATA AND METHODOLOGY

Poverty

Municipal-level poverty data from 17 countries in the region was used to calculate the percentage of poor living in areas exposed to natural disasters in the previous 10 years and in ecosystem areas of high value (Table A1). For 13 countries, data from income poverty maps were used, based on official estimates from the governments, the World Bank, the Inter-American Development Bank, and estimates published in peer-reviewed articles. The methodologies for calculating the poverty maps include regression models from the small area methodology or Bayesian geospatial models.

For the remaining four countries with no available poverty maps, the Unsatisfied Basic Needs Index (UNBI) was used. The UNBI index is an indicator that can help evaluate whether or not households satisfy some key housing needs, such as type of construction materials used, access to drinking water, number of rooms, and some demographic features of the household, such as the number of members, educational level and occupation of the head of household (Feres and Mancero, 2001). As a proxy for the poverty rate, this indicator has benefits as well as limitations. The index uses census information and makes it possible to evaluate and map a poverty proxy for the different administrative divisions of the countries (including the municipal level). It is, accordingly, an alternative measure of poverty in countries for which household surveys do not compile representative data at the municipal level. However, such an index may underestimate poverty in households with basic needs satisfied and income below the poverty line, or in households where the basic needs level has not changed but spending and incomes have been affected by various factors (Feres and Macero, 2001). As new poverty maps become available, the sources of poverty data will be standardized.

**TABLE A1 AVAILABILITY OF POVERTY DATA**

COUNTRY	YEAR	DATA SOURCE	TYPE	LEVEL
Argentina	2010	Centro de Implementación de Políticas Públicas para la Equidad y el Crecimiento (CIPPEC)	Poverty map	Department
Bolivia	2012	Unidad de Análisis de Políticas Sociales y Económicas (UDAPE)	UNBI	Municipalities
Brazil	2010	DATASUS	Poverty map	Municipalities
Chile	2020	Ministerio de Desarrollo Social y Familia, Observatorio Social	Poverty map	Provinces
Colombia	2018	Census (2018)	UNBI	Municipalities
Costa Rica	2011	Instituto Nacional de Estadística y Censos (INEC)	Poverty map	Districts
Dominican Republic	2014	Ministerio de Economía, Planificación y Desarrollo (MEPyD)	Poverty map	Provinces
Ecuador	2014	Institute Nacional de Estadísticas y Censos (INDEC)	Poverty map	Canton
El Salvador	2019	Vollenweider, et al. (2019)	Poverty map	Municipalities
Guatemala	2011	INE y Banco Mundial (2013)	Poverty map	Municipalities
Haiti	2019	Pokhriyal et al. (2020)	Poverty map	Communes
Honduras	2013	Banco Mundial et al. (2017)	Poverty map	Municipalities
Mexico	2020	Consejo Nacional de Evaluación de la Política de Desarrollo Social (CONEVAL)	Poverty map	Municipalities
Nicaragua	2005	Censo (2005)	UNBI	Municipalities
Panama	2011	Dieguez, J (2015)	Poverty map	Districts
Paraguay	2012	Secretaría Técnica de Planificación del Desarrollo Económico y Social (STP)	Poverty map	Districts
Peru	2017	Instituto Nacional de Estadística e Informática (INEI)	UNBI	Districts

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Source: Prepared by authors.

Note: UNBI corresponds to the Unsatisfied Basic Needs Index. The poverty map corresponds to income poverty municipal-level data.

Climate-change-related natural disasters

Data on small and medium impact natural disasters from DesInventar were used (Table A2). Data are available for all countries in the region, except Bahamas, Brazil, Haiti and Suriname. We selected natural disasters associated with climate change, including mudslides, fires, floods, frost, hailstorms, heat waves, torrential rains, hurricanes, cold waves, contamination, blizzards, storms, strong winds and tropical storms. The most recent data available are from 2015 to 2017, except for the Dominican Republic, for which data are only available up to 2000.

TABLE A2 AVAILABILITY OF CLIMATE SHOCK DATA

COUNTRY	PERIOD
Argentina	1970-2015
Barbados	1099-2017
Belize	1931-2011
Bolivia	1970-2015
Chile	1970-2014
Colombia	1914-2018
Costa Rica	1968-2019
Ecuador	1970-2019
El Salvador	1900-2015
Guatemala	1988-2015
Guyana	1972-2013
Honduras	1915-2015
Jamaica	1973-2014
Mexico	2006-2013
Nicaragua	1992-2013
Panama	1933-2020
Paraguay	1978-2017
Peru	1970-2013
Trinidad and Tobago	1899-2014
Uruguay	1959-2014
Venezuela	2001-2015

Source: Prepared by authors.

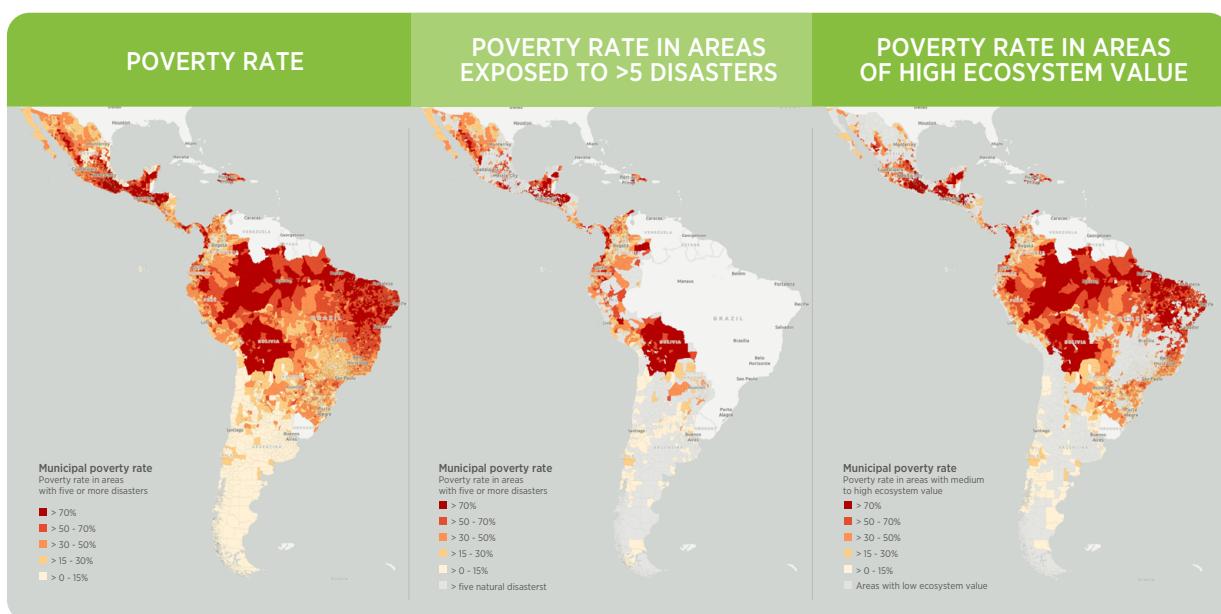
Natural capital and ecosystems

Multiple layers were used to identify areas with high ecosystem value,¹⁶ including ecosystem services data from Stanford's Natural Capital World Viewer ([NCP](#)), critical environmental assets data ([Chaplin-Kramer et al., 2022](#)), coastal habitat data from the Open Integrated Economic-Environmental Modeling Platform ([IEEM](#)), protected area data from Protected Planet, and deforestation data from the World Wild Fund ([WWF](#)). Furthermore, to identify areas of high ecosystem value at the municipal level, we used municipal-level administrative division layers available from the United Nations Office for the Coordination of Humanitarian Affairs ([OCHA](#)).

16. Areas of ecosystem value are defined as those with a concentration of natural capital greater than the country's median. Areas with highest concentration of natural capital, also known as critical environmental assets, are defined as the natural and semi-natural terrestrial and aquatic ecosystems necessary to maintain the Nature Contributions to People (NCP), at both the local and global levels. At the local level, 12 NCPs are considered, including, for example, nitrogen and sediment retention, crop pollination, timber production and fish stocks for fisheries. At the global level, two NCPs related to climate regulation are considered: carbon storage in terrestrial ecosystems and vegetation-regulated recycling of atmospheric moisture (Chaplin-Kramer et al., 2022).

ANNEX 2. RESULTS

**GRAPH A1 PPOVERTY IN AREAS EXPOSED TO NATURAL DISASTERS
AND AREAS OF HIGH ECOSYSTEM VALUE (PERCENTAGE)**



Source: Prepared by authors based on natural disaster data from DesInventar, Chaplin-Kramer et al. (2022) and national poverty data (Annex 1, Table A1).

Note: For more regional maps, see [Climate Change & Poverty Dashboard](#). For Argentina, poverty data corresponds to province-level data. Poverty maps are subject to change as more recent poverty data at municipal level becomes available.

TABLE A3 PPOVERTY IN AREAS EXPOSED TO FIVE OR MORE NATURAL DISASTERS IN THE PREVIOUS 10 YEARS (%)

COUNTRY	CCVI	RISK	PERCENTAGE OF POOR	POVERTY RATE
Argentina	6.66	Medio	66.0	12.0
Bolivia	2.48	Extremo	98.3	80.2
Chile		Bajo	92.1	11.3
Colombia	4.30	Alto	97.3	22.2
Costa Rica	7.70	Bajo	100.0	24.1
Dominican Republic	1.01	Alto	82.4	35.7
Ecuador		Extremo	100.0	41.6
El Salvador	0.79	Extremo	84.3	29.5
Guatemala	0.75	Extremo	69.5	68.7
Honduras	0.92	Extremo	86.8	77.3
Nicaragua	1.19	Medio	72.5	49.7
Panama	5.57	Extremo	53.7	30.1
Paraguay	1.58	Alto	71.8	39.4
Peru	4.98	Extremo	51.1	21.6

Source: Prepared by authors based on DesInventar natural disaster data and municipal poverty data. The risk level is determined using the [Climate Change Vulnerability Index](#) (CCVI) and with CAF (2014).

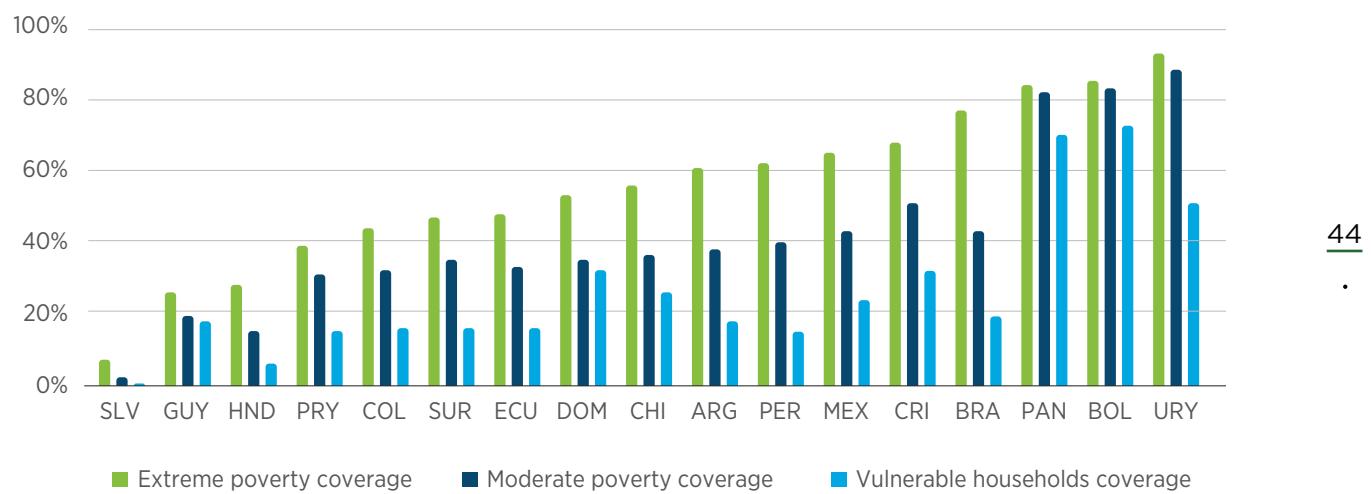
**TABLE A4 POVERTY IN AREAS OF HIGH ECOSYSTEM VALUE (%)**

COUNTRY	PERCENTAGE OF POOR PEOPLE			POVERTY RATE		
	Total	Global	Local	Total	Global	Local
More biodiverse						
Brazil	72.3	36.6	62.9	50.2	65.6	48.1
Colombia	72.7	56.1	57.4	22.4	21.7	19.8
Ecuador	79.3	48.5	68.4	43.2	47.5	42.5
Mexico	55.5	1.8	55.1	66.0	69.9	66.0
Peru	77.9	36.4	64.7	39.3	44.3	36.6
Other countries						
Argentina	45.8	18.2	41.3	16.4	23.6	15.7
Bolivia	90.9	81.8	77.8	79.7	79.8	78.7
Chile	83.9	7.9	83.9	11.9	11.8	11.9
Costa Rica	74.9	17.0	73.8	23.9	26.7	23.8
Dominican Republic	56.6	0.0	56.6	49.8	0.0	49.8
El Salvador	56.5	0.8	56.0	29.6	29.2	29.6
Guatemala	73.1	12.6	72.1	71.0	76.6	71.2
Haiti	66.0	8.5	64.0	74.2	73.0	74.0
Honduras	71.0	0.8	70.4	79.5	77.9	79.6
Nicaragua	53.3	3.4	52.0	29.7	25.7	29.6
Panama	59.7	19.3	57.4	56.5	64.2	55.6
Paraguay	71.4	12.9	70.6	28.9	26.5	29.2

Source: Prepared by authors based on data from Chaplin-Kramer et al. (2022) and municipal poverty data.

ANNEX 3. COVERAGE OF SOCIAL PROTECTION PROGRAMS

GRAPH A3 COVERAGE OF SOCIAL PROTECTION PROGRAMS

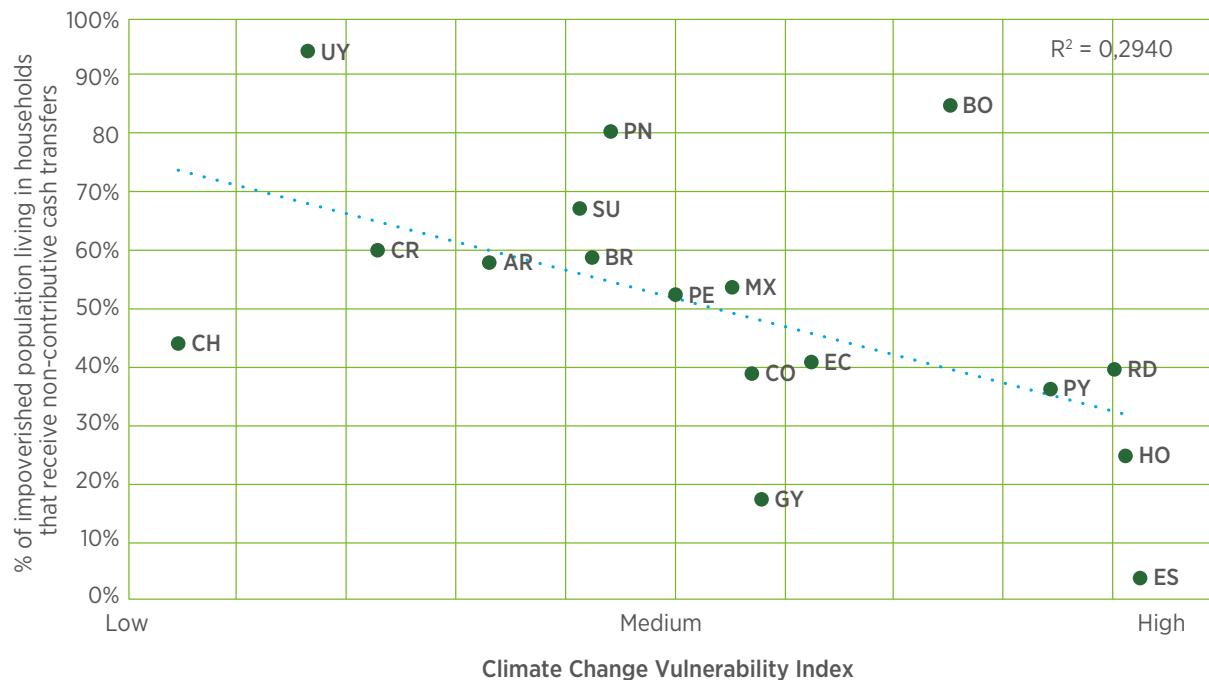


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Source: Prepared by authors based on Stampini et al. (2021).

GRAPH A4 CLIMATE VULNERABILITY AND SOCIAL PROTECTION COVERAGE



Source: Prepared by authors based on Stampini et al. (Unpublished document) and the [Climate Change Vulnerability Index](#) (CCVI).

