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CREATING CLIMATE RESILIENCE IN CENTRAL AMERICA'S DRY CORRIDOR:

Strengthening Local Institutions Through
Social Entrepreneurship



Miller Center
for Social Entrepreneurship



Santa Clara
University

Photo credit: Sistema Biobolisa

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EXECUTIVE SUMMARY

The detrimental effects of global climate change are already being felt, with the greatest impacts affecting the world's poor. Countries and communities across the developing world are experiencing the effects of climate change-intensified droughts, flooding, crop losses, disruption of water supplies, and the spread of diseases. Conventional approaches to economic development are poorly suited to address this new reality. Innovative strategies that foster climate resilience—the capacity to withstand the stresses of climate disruption and still retain the ability to develop—are required.

One region suffering pronounced effects of climate disruption is the dry corridor of Central America. Heavily dependent on subsistence farming, rural communities in the Central American dry corridor are already experiencing drought, food insecurity, diminished quality and access to drinking water, health issues, and deteriorating local economies. Climatic stress exacerbates broader challenges throughout the region—including the slow recovery from decades of war, persistent violence, migration, poverty, political instability in several countries, and other widespread social issues.

Climate and social scientists agree that pathways to climate resilience must be created locally to address the problems caused by climate disruption. Miller Center for Social Entrepreneurship at Santa Clara University (SCU) believes that social entrepreneurship and innovation practices can strengthen the ability of local institutions to promote climate resilience. Social enterprises enhance the operational capacity, efficiency, and long-term social and economic sustainability of local institutions—and this can foster the adaptive capacity essential to climate resilience. Thus, investing in social entrepreneurship and building stronger local institutions has emerged as a key climate resilience strategy.

Miller Center and SCU faculty are studying and, with local institutions, collaboratively creating pathways to climate resilience in Central America's dry corridor. Lessons from these efforts hold promise for other at-risk regions responding to climate disruption.



INTRODUCTION

Climate change is already threatening the health, livelihoods, and security of 2 billion rural residents across the globe. The United Nations scientific panel on climate change just released a landmark special report warning that without urgent actions that transform economies to reduce greenhouse gas emissions and build resilience, the anticipated average global temperature will rise to above the 1.5°C goal in about two decades, worsening food insecurity, and wildfires, and a damaging coral reefs.¹ To respond, local communities are developing the capacity to absorb the stresses caused by climate disruption and the ability to flourish in the face of present and future threats. This paper explains how social entrepreneurship can build capacity with local institutions to foster climate resilience, the capacity to withstand the stresses of climate disruption and still retain the ability to develop.²

The Central American *corredor seco* (dry corridor)—stretching through the Pacific coastal lowlands and foothill regions of Guatemala, El Salvador, Honduras, Nicaragua, and parts of Costa Rica and Panama—is highly susceptible to climate disruption. Recurrent droughts, excessive rains, and severe flooding harm agricultural production and livelihoods in this landscape, affecting more than 10 million people, including more than 1 million families who rely on subsistence farming.

Miller Center for Social Entrepreneurship and affiliated faculty at California’s Santa Clara University (SCU) are studying avenues for climate resilience in this threatened region—including improving access to food and water—to meet this pressing challenge. They are working with local partners to understand what kinds of climate resilience strategies work here, and how they can be shared with other regions.

Drawing insights from its global network of social entrepreneurs, Miller Center believes that using social entrepreneurship and innovation practices can strengthen the ability of local institutions to build greater climate resilience. SCU’s work in the dry corridor represents a compelling example of how applying social entrepreneurship principles and action research through collaborative partnerships can help local institutions in high-risk regions better respond to the stresses of climate change and variability.





Photo credit: Sistena Biobolsa

How Climate Disruption Impacts the Dry Corridor of Central America

Worldwide, disruption caused by climate change and violent conflict threatens to upend the fragile gains associated with decades of sustainable development initiatives. Climate disruption’s negative impacts are not evenly distributed; rather, they are more pronounced in specific geographic regions and among highly vulnerable populations.

Rural communities—especially in the tropics—are especially vulnerable to the negative impacts of climate change because they depend on local natural resources for their food, water, fuel, and shelter. As the average global temperature increases, the consequences of climatic change will exert ever-more negative impacts on the rural poor, and the risks will increase as climate change accelerates.

The Central American dry corridor is a globally significant region that is acutely vulnerable to climate disruption, “due to its geographical location, high climate variability, exposure to extreme weather events, as well as the institutional and socio-economic weaknesses of its population.”³

The negative effects of climate change threaten food security as well as the quality and availability of drinking water. Climate disruption can also contribute to decreased human and livestock health due to the spread of tropical diseases and exacerbate habitat destruction by exploiting biological energy sources, often worsening poverty as precarious income levels fall.

Central American Dry Corridor



Source: Santa Clara University (Cartographer: Claire Smoker)

The Central American dry corridor includes dry tropical forests covering Pacific coastal lowlands as well as pre-mountain regions in these countries. Climate risks in the dry corridor are associated with more extreme droughts and weather events—potentially including the severity of draughts between 2014 to 2017, which left at least 3.5 million people food insecure, and increasingly frequent experiences of excessive rains and flooding.

In addition to climatic stress, broader challenges throughout the dry corridor region—including the slow recovery from years of war, persistent violence, migration, poverty, political instability in several countries, and other widespread social issues—have worsened the overall quality of life for many residents in the last two decades. This is despite the fact that economic growth and continued international development cooperation have contributed at the national scale to reduce average poverty and malnutrition rates.

Of the 10.5 million inhabitants in the dry corridor, an estimated 6 million people, or nearly 60% of the region's total population, directly depend on subsistence farming, which is highly susceptible to climate-induced disruptions. According to an article in *Climate and Development*⁴, climate change can negatively affect farmers in ways that include:

- Reduced crop productivity
- Increased pest and disease activity affecting both crops and livestock
- Barriers to harvesting and processing agricultural produce
- Interruption of access to markets due to severe weather
- Restricted livelihood options
- Degradation of ecosystems that serve as natural buffers against floods, landslides, and soil erosion
- Disrupted social networks and the loss of years of financial savings as a result of climate-related disasters



As an example, many small-scale farmers in the Central American dry corridor grow maize and beans on hillsides, following traditional crop management practices. Low rainfall during periods of drought reduces crop yields, resulting in more malnutrition in children. Households are vulnerable to not only running out of food, but also failing to generate sufficient income to pay for other necessities.

Social issues in the dry corridor compound the risks caused by climate change and increase the vulnerability of these communities. For instance:

- Unequal access to resources between wealthy and poor inhabitants exacerbates the plight of the area's smallholder farmers, making it less likely that they can draw on financial resources in response to extreme weather events or other threats.
- Widespread degradation and pollution of the ecosystem directly threatens residents' health and makes it more difficult to access clean drinking water or to successfully find and farm arable land.
- Inefficient capacity for natural resource management contributes to deforestation in critical ecosystems that conserve biodiversity, maintain soil fertility, regulate local temperatures, and sustain a reservoir of wild foods that poor families can access during critical periods of seasonal hunger.
- In many cases, existing institutions are too weak to significantly reduce vulnerabilities in the dry corridor. For example, the International Crisis Group links the exceedingly high crime rates in the Northern Triangle countries of Honduras, El Salvador, and Guatemala to failure of governments, citing these communities as "characterized by negligible public services, limited economic opportunities, and a population recently displaced by civil war, deportation, and impoverishment."⁵





Photo credit: Sistema Biobolsa

Poverty and Climate Change Impacts

Climate scientists and social scientists have reached a strong consensus that climate adaptation and resilience must be local. This is the scale at which negative impacts will be most severe. While national and international policies are critical to reduce greenhouse gas emissions, actions such as reducing carbon footprints are not the same as climate resilience. Most actions to adapt to climate disruption will occur through local institutions rather than at the national or international levels. Additionally, a disproportionate number of those local institutions will be located in poor regions.



Photo credit: Asdenic

In his 2015 encyclical on the environment, *Laudato Si'*, Pope Francis said:

Climate change is a global problem with grave implications: environmental, social, economic, political, and for the distribution of goods. It represents one of the principal challenges facing humanity in our day. Its worst impact will probably be felt by developing countries in coming decades. Many of the poor live in areas particularly affected by phenomena related to warming, and their means of subsistence are largely dependent on natural reserves and ecosystematic services such as agriculture, fishing, and forestry. (Paragraph 25)

Due to persistent patterns of gender-based inequality, especially among poor populations, women tend to be more vulnerable to the effects of climate change than men. As a result, strategies to manage the risks associated with global climate change must take gender-related factors into account.

Prior development efforts in the Central American dry corridor have taken the form of multilateral loans, government programs, private-sector investments, and various development projects aimed at reducing poverty. While these programs and projects helped in some cases, overall results have been mixed.

On one hand, several significant projects supporting education have helped increase the average primary and secondary school completion rates in the region. On the other hand, some large-scale hydroelectric projects in the highlands near the dry corridor have displaced thousands of rural residents in order to supply electricity for cities and industry, leaving neighboring communities in poverty. Additionally, such large-scale efforts can provoke social protest as locals defend their water, land, and livelihoods.



Climate Resilience and the U.N. Sustainable Development Goals

The United Nations Sustainable Development Goals (SDGs) are a set of 17 “global goals” serving as a universal call to action to end poverty, protect the planet, and ensure that all people enjoy peace and prosperity. A number of the SDGs relate quite specifically to issues of climate resilience:

- SDGs aimed at ending hunger, ensuring sustainable consumption and production patterns, protecting ocean and marine resources, and protecting land resources (e.g., sustainably managing forests, combating desertification, halting and reversing land degradation, halting biodiversity loss) are related to agricultural-related climate resilience activities focusing on productive yet sustainable farming and harvesting of natural resources.
- SDGs promoting education and decent work and economic growth tie into climate resilience activities aimed at improving rural livelihoods.
- SDGs designed to ensure clean water and sanitation, access to affordable and clean energy, and sustainable cities and communities are linked to climate resilience efforts focused on providing clean energy, water, and sanitation.
- An SDG aiming to promote good health and well-being can be addressed through climate resilience activities that strengthen health systems so they're better able to prevent and treat conditions.



Even when local adaptations and innovations help at critical moments, hunger, malnutrition, water insecurity, and other challenges can persist. For example, many farmers in Central America save corn and bean seeds, while others plant hybrid seeds sold by agrochemical stores. Although several farmers' groups have worked through seed-saver networks to develop and carefully curate locally adapted seeds that are often preferred by smallholders, most farmers do not have ready access to these networks and have not fully implemented the sustainable agricultural principals. Crop yields remain low, and harvests are susceptible to loss from drought and pests, which decreases household food security and nutrition.

The drilling of wells for village drinking water systems represents another type of development project important for survival, but one that is not sufficient to assure thriving rural communities. New wells supply water for those in need, but persistent health problems and water testing reveal that many of these same communities' water supplies remain contaminated with numerous pollutants including bacteria, agrochemicals, and sometimes heavy metals.



SOCIAL ENTREPRENEURSHIP CAN FOSTER CLIMATE RESILIENCE

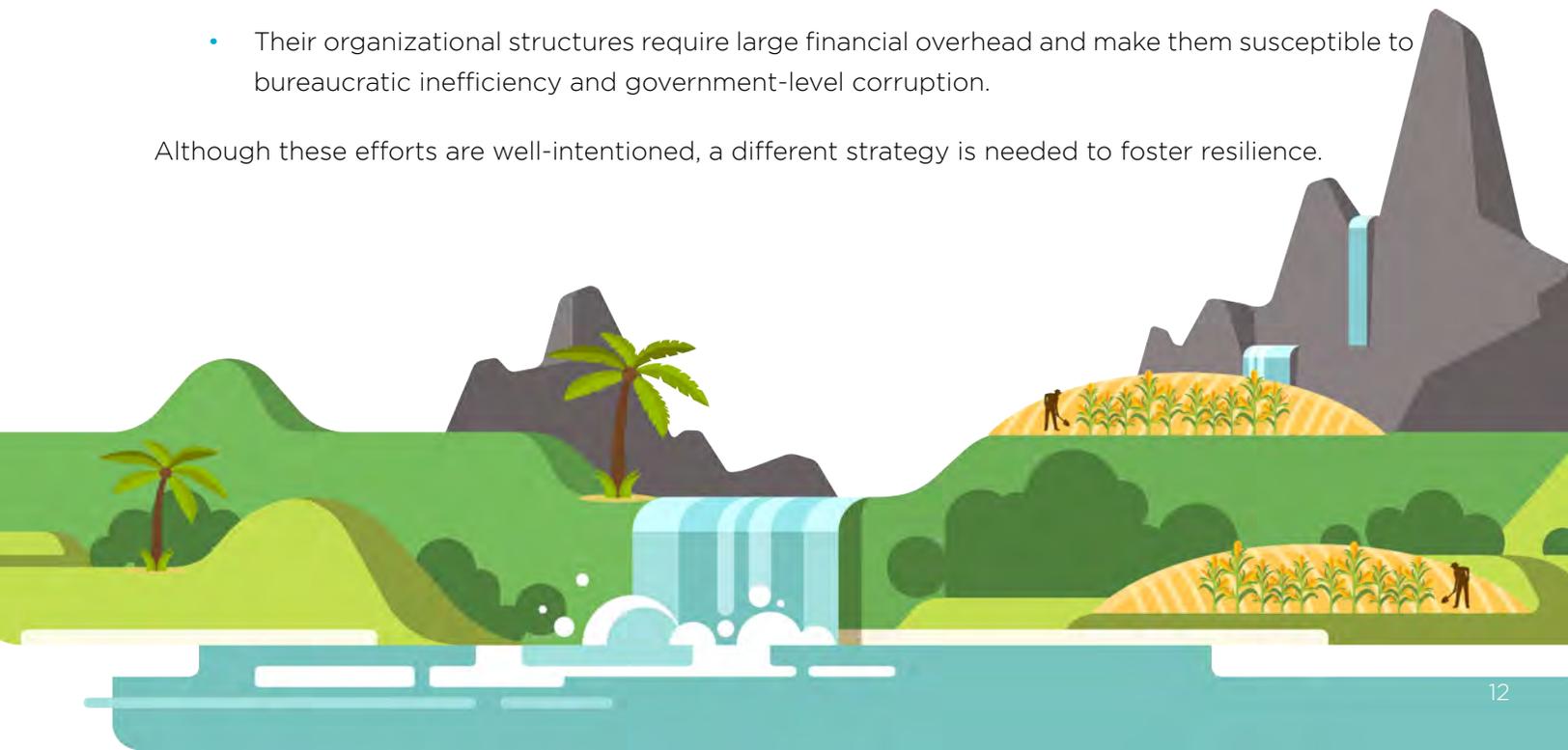
According to a presentation on climate-resilient pathways from the United Nations Intergovernmental Panel on Climate Change (IPCC) Working Group II—which focuses on climate-change impacts, adaptation, and vulnerability—“Climate-resilient pathways are development trajectories that combine mitigation and adaptation to realize the goal of sustainable development and help avoid ‘dangerous interference with the climate system.’”⁷

Climate resilience enhances the capacity of individuals, families, and communities to resist the stresses of climate change that already threaten their health, livelihoods, and security, and to adopt more sustainable systems to cope with future climate-change impacts. Bundles of activities, also known as pathways, that build climate resilience help vulnerable populations prepare more effectively for climate-related disruptions.

Few government policies, international aid efforts, or conventional economic development approaches succeed in fostering climate resilience, at least as these approaches have been practiced until now. They fall short for a number of reasons, largely caused by a disconnection between the solution providers and the recipients of the solutions. For instance:

- Their broad focus makes them less well-suited to the particular needs of a given community.
- Their top-down, policy-driven solutions, created and administered by people from outside the communities, are less likely to be embraced by the people they’re meant to serve.
- Their organizational structures require large financial overhead and make them susceptible to bureaucratic inefficiency and government-level corruption.

Although these efforts are well-intentioned, a different strategy is needed to foster resilience.



Social enterprises are economic organizations that pursue a social goal from within a particular community. Because their goals and economic structures arise from and are embedded within the communities they serve, social enterprises have the potential to succeed where large-scale, externally driven projects fail. Gregory Dees, a pioneering scholar in this field, proposed that social entrepreneurs play the role of change agents in the social sector by:

- “Adopting a mission to create and sustain social value (not just private value),
- “Recognizing and relentlessly pursuing new opportunities to serve that mission,
- **“Engaging in a process of continuous innovation, adaptation, and learning”,**
- “Acting boldly without being limited by resources currently in hand, and
- **“Exhibiting heightened accountability to the constituencies served and for the outcomes created.”⁸**

***Note that the two bolded points, in particular, make social enterprises—relative to other institutional strategies—better able to undertake the kinds of activities necessary to foster climate resilience.**

Social enterprises apply business processes to generate revenues while solving social issues. Social enterprises are commonly structured as for-profit entities, but social entrepreneurs are motivated by social impact rather than profit. Unlike some aid organizations that focus on providing emergency responses to immediate crises, social entrepreneurs take a medium- to longer-term view of the problems they aim to solve. This long-term view has already spurred many social entrepreneurs to focus on ways to increase climate resilience.

- By applying local insights to local problems, social enterprises are often better able to create solutions to solve those problems effectively and affordably.
- Social enterprises are also more likely to deliver essential goods and services in ways that low-income and marginal communities need—often enlisting community members to participate in the sale, distribution, and ongoing support of those goods and services.
- As a result, social enterprises are generally better positioned than either aid and charity organizations or strictly profit-based businesses to jumpstart local markets, create sustainable livelihoods, and provide lasting solutions for energy poverty; water poverty; persistent vulnerability to drought, flooding and landslides; and other climate disruption-related shocks and threats.

Miller Center for Social Entrepreneurship and Climate Resilience

Miller Center for Social Entrepreneurship is the premier university-based social enterprise accelerator. Miller Center accelerates entrepreneurship to end global poverty and protect the planet. Miller Center is home to the pioneering Global Social Benefit Institute (GSBI®), which develops capacity in social enterprises, helping them become investment-ready and able to scale for widespread impact.

Distinctive aspects of the GSBI approach include in-depth mentoring provided by seasoned Silicon Valley executives and connections with impact investors. Since its founding in 2003, the GSBI has worked with more than 900+ social enterprises in more than 100 countries. Approximately half of GSBI social enterprises foster climate resilience by providing clean water and energy technologies, thereby enhancing agricultural production and rural livelihoods.

LOCAL INSTITUTIONS AND CLIMATE RESILIENCE IN CENTRAL AMERICA

Local institutions are key to climate change adaptation and resilience. A local institution in this sense is more than a proper organization, for it also means formal and informal patterns of human behavior. Examples include local markets, or cooperative approaches to watershed management.

According to Arun Agrawal, adaptation to climate change is inevitably local, and local institutions influence adaptation in three critical ways:

- a) “They structure impacts and vulnerability,
- b) “They mediate between individual and collective responses to climate impacts and thereby shape outcomes of adaptation, and
- c) “They act as the means of delivery of external resources to facilitate adaptation, and thus govern access to such resources.”⁹

Local institutions that are motivated by their social mission, accountable to local communities, and themselves have adaptive capacity, are well positioned to foster climate resilience. Although Agrawal does not specifically identify social enterprises, he calls for organizations that exhibit their attributes.

Central America has a rich cultural history and strong set of community-based institutions long active in struggles for social justice and more sustainable agriculture. Climate resilience strategies to reduce the household- and community-level exposure and response to risks from social, political, economic, and environmental hazards must, necessarily, be crafted in collaboration with them.

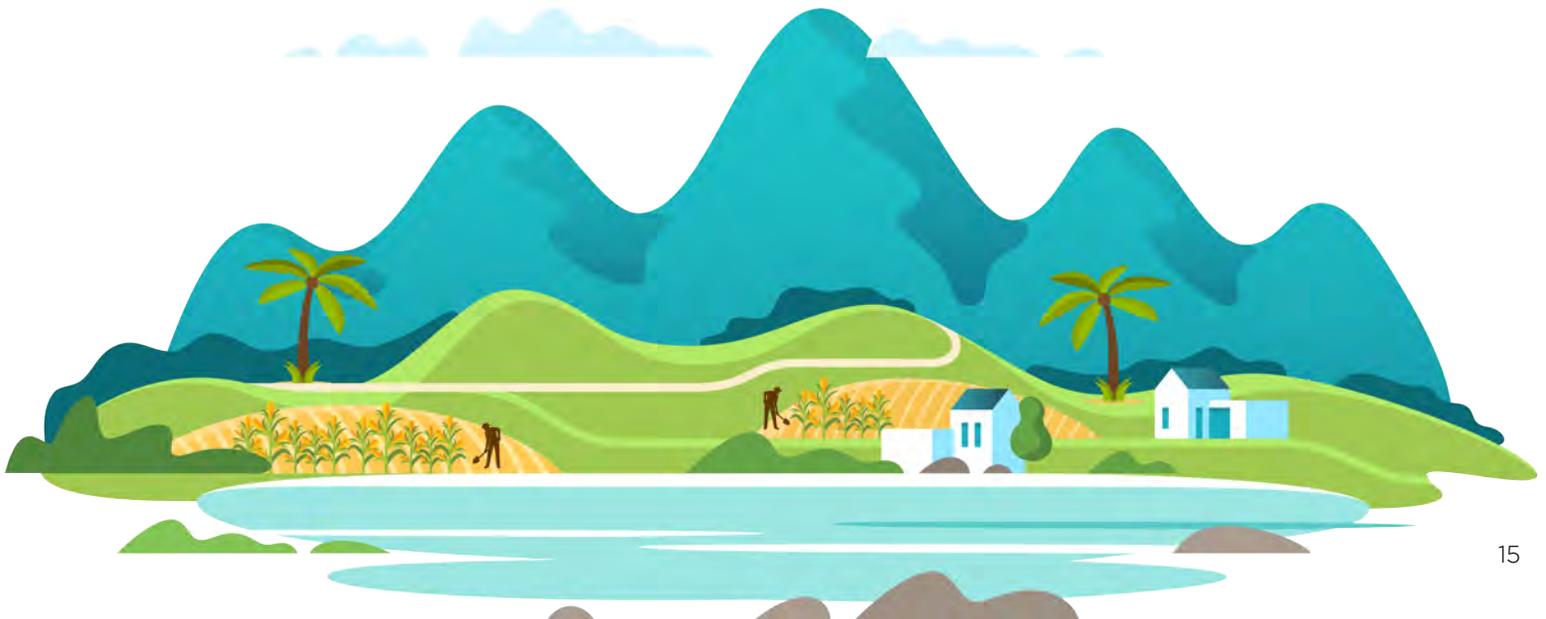




Photo credit: Asdenic

Local Institutions in Central America

The creation of climate resilience with social entrepreneurship and innovation practices requires collaborating with existing locally embedded organizations, such as:



COOPERATIVES AND FARMER ASSOCIATIONS

More than 100,000 farmers are affiliated with agricultural cooperatives in the region, many of which have responded to climatic change by improving market access, expanding credit programs, developing programs for gender equity, participating in research, connecting to government agencies, channeling food assistance relief, and supporting agricultural extension agents that train farmers in strategies to manage their crops and adapt to climatic variability.

Farmers affiliated with the '*campesino-a-campesino*' movement (MCaC), which also number more than 100,000 in the region, use horizontal farmer-to-farmer trainings to share best agroecological farming approaches that aim to enhance farmer autonomy, improve subsistence production, diversify farms, and save locally adapted drought-tolerant seeds.



VILLAGE WATER AND SANITATION COMMITTEES

In Honduras and Nicaragua, legislation decentralized water management and created community-based water committees that govern water resources and provide drinking water access to rural residents. As climate disruptions continue, thousands of committees are seeking strategies to find new water sources, expand village water systems to bring piped water into houses, pump water to those in need, and develop a socially just cost-recovery model for maintenance and new investment.



INFORMAL COMMUNITY-BASED INSTITUTIONS

For more than 100 years, indigenous residents have shared behavioral norms, worldviews, and practices that they rely upon to navigate climatic vulnerability, extreme weather events, and other shocks. Rural residents frequently use labor exchanges (*mano vuelta*) and community workdays to reforest, conserve soil, and protect water sources. In many communities, common property areas, such as pastures, forests, and the edible plants alongside rural roads, are available for the lowest-income families to access as a coping strategy to mitigate seasonal hunger.



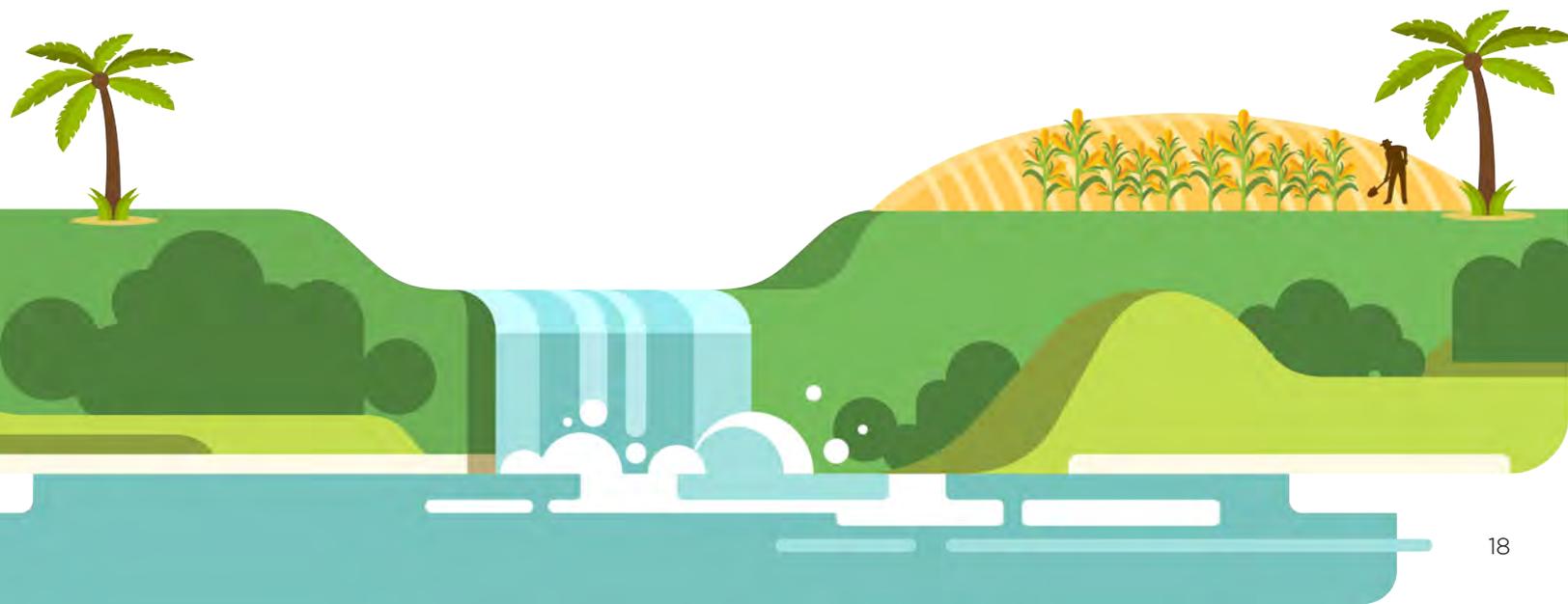
MUNICIPAL GOVERNMENTS

The more than 50 municipal governments in Central America's dry corridor could play an important role coordinating aid agencies and national programs that benefit thousands of rural communities. They could help address climate adaptation, coordinate emergency relief, manage natural resources, and coordinate law enforcement and local courts to provide access to legal justice and basic safety.

Existing local institutions have long-term relationships with rural and peri-urban residents in the Central American dry corridor. They have historically responded to pressing local needs: improving access to clean water, providing sanitation solutions, and sharing strategies for agroecology and sustainable land management. They are also responding to climate disruption; however, these institutions vary widely in their ability to perform and are often undermined by broader political and economic forces. Additionally, climate disruption's potential to exacerbate the persistent food and water insecurities, combined with the weakening of some local institutions, calls for new tools and innovative approaches.

Acting alone, some of the local institutions in the Central American dry corridor have exhibited weaknesses in the effectiveness of their responses. For instance:

- **Cooperatives** exporting to international commodity markets faced price fluctuations, including low coffee prices, at the same time they lost their harvest due to leaf rust. These two disruptions combined with droughts to worsen food and water shortages (Bacon et al. 2017).
- Some community groups affiliated with **village water committees** lack the capacity to perform key administrative functions, such as collecting monthly payments for water system maintenance or finalizing their legal papers.
- **Informal community institutions** are increasingly frayed and less effective as residents increase dependence on cash incomes, migrate, or become unwilling to volunteer their time. Poorly planned or rigid local economic development projects can further undermine these institutions as they seek to privatize community water sources or expand irrigation for larger farmers—leaving depleted and contaminated conditions for poor downstream residents.
- **Municipal governments** also face myriad challenges, with many lacking resources for sustained presence in remote dry corridor villages and unable to enforce the rule of law or meet residents' need for local development projects.



HOW SOCIAL ENTREPRENEURSHIP CAN BOLSTER LOCAL INSTITUTIONS

One important role of social entrepreneurship is to help strengthen the ability of local institutions—enterprises, co-ops, community-based organizations, and local markets—to navigate the effects of climate disruption. Investing in social entrepreneurship and building stronger local institutions is becoming a key strategy for cultivating climate resilience in the Central American dry corridor.

Social enterprises can improve local institutions' operational capacity, efficiency, and long-term social and economic sustainability—which contribute to adaptive capacity. Social entrepreneurship approaches can be linked to different types of adaptive capacity-building activities that enhance climate resilience. Building adaptive capacity is an iterative process that links enhanced risk management with practices that address structural deficits such as barriers to income, education, health, and mobility in households, as well as organizational capacity, marketing, and democratic governance at the institutional level.

Examples of risk management strategies include crop diversification, formal and informal insurance at the household level, system-level insurance, early warning systems, disaster compensation, and investment diversity.



Social enterprises can help local institutions build adaptive capacity in a number of ways, including through the establishment and scaling of social enterprises that address:

- **Agricultural production**, which enhances productivity or diversifies sustainable farming and harvesting of natural resources for improved risk management. Specific activities related to agricultural production could include agricultural services, agricultural technology, agricultural biodiversity, agricultural finance and insurance, biochar production, irrigation and rainwater harvesting, organic fertilizers and plant protection, or crop and apiculture diversification.
- **Food system innovations**, which enhance access to healthy and culturally preferred food or augments incomes, especially during critical periods of seasonal hunger or droughts, conflict, and other stressors that need improved risk management. Specific activities related to food system innovations could include community-based seed banks, participatory plant breeding, community-based grain banks, food storage solutions, or farmers scaling up in the value chain.
- **Improved livelihoods**, which increases availability and stability of jobs and income in rural areas, as alternatives or supplements to agriculture and a strategy to address structural deficits. Specific activities related to improved livelihoods could include artisan and alternative livelihoods, agriculture focused on income, co-ops and smallholder farmers, job training, market linkage, financing, and supply-chain services.
- **Improved safe water access and sanitation**, which builds household and community capacity to be productive and healthy while preserving the environment—a strategy that helps remedy structural deficits. Specific activities related to improved safe water access and sanitation could include water filters and systems, sustainable fuels, alternative energy production, and energy efficiency solutions.

Social entrepreneurship can connect local institutions to longer-term investments and private-sector partners, notably so-called impact investors. Impact investors make their investment decisions based on some combination of potential social or environmental impact and potential financial gain. Private-sector partners can include corporations with corporate responsibility programs, as well as corporations making other commitments to addressing pressing global problems.



ACCELERATING AND REPLICATING SOCIAL ENTERPRISES

The many ways in which social enterprises can help support and extend the actions of local institutions highlight the need for accelerating and replicating social enterprises. Miller Center for Social Entrepreneurship is a leader in the acceleration and replication of social enterprises globally.

Through its GSBI programs, Miller Center works to accelerate entrepreneurship with the explicit goals of ending global poverty and protecting the planet. Its focus is on climate resilience and women's economic empowerment.

The Miller Center Replication Initiative, launched in 2016, builds on its 13 years of supporting social enterprises through the GSBI. Replicating proven social enterprise business models, rather than starting over from scratch, promises to significantly decrease the time and resources expended on getting any particular social enterprise up and running and scaled. Replicated enterprises can also present reduced risks for impact investors.

For instance, many social enterprises address a similar problem, such as lack of access to drinking water or to clean, affordable energy—but using highly localized solutions. Replication means taking a business model validated in one location, reproducing it, and introducing it to other geographic regions facing the same problem.

The key to replication is to ensure that the underlying business model is adapted and tailored to the specific needs of the new locale or market.

Miller Center is developing a methodology to identify sets of best practices along with the conditions under which successful social enterprises operate, to inform the development of “playbooks” that can help up-and-coming social entrepreneurs learn from the achievements and setbacks of those who have traveled similar paths before.



Because so many of the issues facing the Central American dry corridor are also experienced elsewhere in the world, the region is an excellent candidate for replication. A few examples from previous GSBI participants include:

- **Sistema Biobolsa** (GSBI 2014) enhances farmer livelihoods and reduces greenhouse gas emissions through its hybrid reactor biodigesters, which transform animal manure into biogas and a potent, natural fertilizer. Sistema Biobolsa is based in Mexico and also operates in Nicaragua.
- **Komaza** (GSBI 2014) works to get dryland farmers in Africa out of extreme poverty while addressing Africa's multibillion-dollar wood supply crisis through innovative forestry: helping families plant trees for a dollar that are later sold for \$30.
- **GRUPEDSAC** (GSBI 2009) works toward sustainable rural development and livelihoods for Mexican farmers and the environment by providing training and installation of ecotechnologies that satisfy basic needs for water, food, housing, energy, and proper waste management.
- **Nazava** (GSBI 2012) sells highly effective low-cost water filters that allow households in Indonesia to filter their own tap, well, river, or rain water.
- **Illuméxico** (GSBI 2013) sells affordable solar home systems that bring lighting to rural Mexican households that are not connected to the electricity grid.
- **Naandi** (GSBI 2008) works to bring safe water to India's villages and communities, using the link between poverty and water availability and quality to aim toward its ultimate goal of eradicating poverty.
- **Jibu** (GSBI 2014) provides a comprehensive, turnkey startup package for local entrepreneurs in the Democratic Republic of the Congo, Rwanda, and Uganda to start their own neighborhood businesses by treating and packing water in reusable bottles.



Photo credit: GRUPEDSAC (Left), Jibu (Right)



PARTICIPATORY RESEARCH IN THE CENTRAL AMERICAN DRY CORRIDOR: FACULTY

Christopher Bacon, Santa Clara University associate professor of environmental studies and sciences and an author of this paper, has been involved with a number of research projects in the Central American dry corridor, including action research projects with SCU students and Global Social Benefit Fellowship (GSBF) program fellows.

Bacon formed an interdisciplinary team with colleagues William A. Sundstrom, Iris Stewart-Frey, and Edwin Maurer, along with SCU students, to research how coffee farmers in Nicaragua are grappling with several complex issues, including:

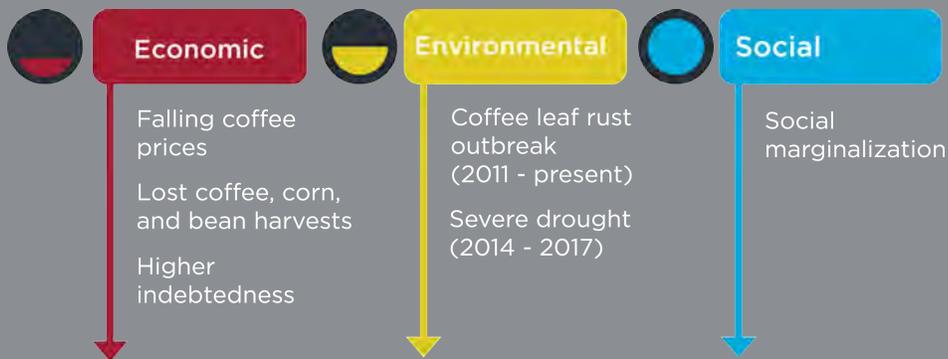
- Food insecurity
- Regional water quality, including widespread contamination with E. coli
- The rapid spread of the coffee leaf rust, a fungus and coffee pathogen that has caused more than a billion dollars in damage to coffee plantations since 2011
- A lengthy drought likely exacerbated by climate change



COPING RESPONSE TO ECONOMIC AND ENVIRONMENTAL STRESSORS IN NICARAGUA

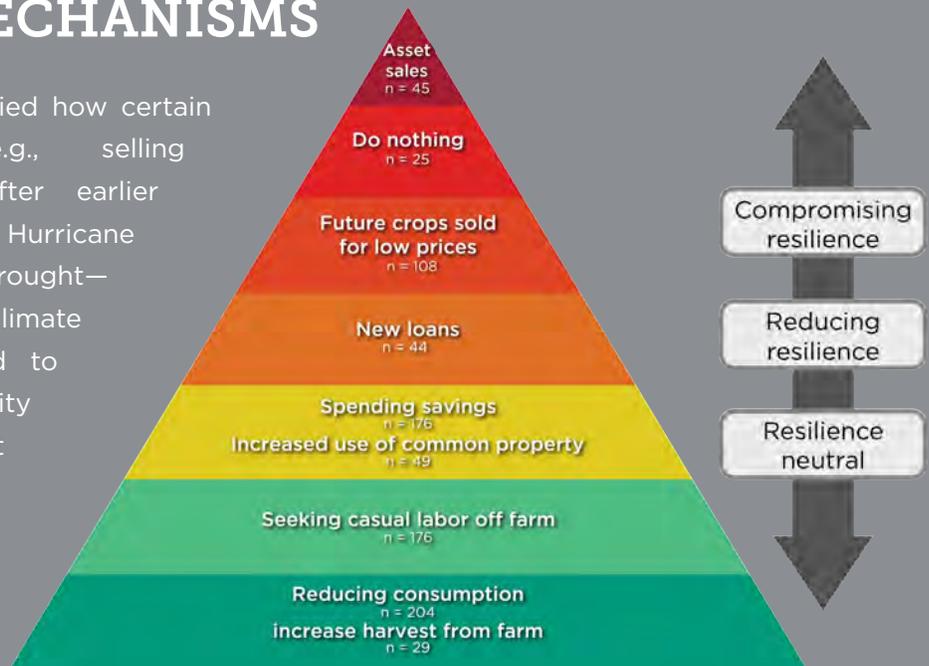
Source: Household surveys: Bacon et al 2017

STRESSORS



COPING MECHANISMS

This study also identified how certain coping methods—e.g., selling productive assets after earlier climatic events, such as Hurricane Mitch or the 2009 drought—compromised climate resilience and tended to deepen their vulnerability to subsequent hazards.¹⁰



Falling incomes and smaller harvests decrease food security

Stronger shocks and lower adaptive capacities lead to resilience compromising responses

Coping responses reported by 366 farmers in 2014

The research team's work in partnership with local farmers and with organizations such as the Community Agroecology Network, ASDENIC, and the PRODECOOP cooperative.

Specific research projects have included:

- Designing a community-based approach to monitoring and testing water quality with Nicaraguan cooperatives, water committees and coffee farmers, assessing technologies to improve water access and irrigate their crops, incorporating GIS (Geographic Information Systems) to analyze and visualize data on maps and help identify environmental trends
- Sophisticated statistical analyses of the household survey and hydrology data
- Refinement of global computer models that, for example, predict a temperature rise in a large area of the earth, to project the future anticipated impacts on a much smaller area, such as those in northern Nicaragua
- Participatory survey research with community promoters and several hundred households in northern Nicaragua
- Analysis of whether funds provided by the World Bank and other organizations to combat the coffee leaf rust outbreak are enhancing the farmers' resilience to future risks, or whether the aid produces more vulnerability among the population¹¹

SCU faculty members and collaborating local researchers from ASDENIC and PRODECOOP cooperative recently conducted 366 farmer surveys in Nicaragua to analyze livelihood security and seasonal hunger.

The team found that seasonal hunger is common and influenced by the timing of annual precipitation patterns that shape the agricultural calendar especially the corn, bean and coffee harvests, and that farmers reporting shorter period of seasonal hunger generally had:

- Slightly larger farms and higher incomes
- Produced more than half of their own food
- Cultivated more fruit trees





Action Research for Social Entrepreneurship: Student Fellows

Action research provides a practical and effective way to evaluate how social enterprises can best foster climate resilience in partnership with existing local institutions. As practiced through Miller Center's Global Social Benefit Fellowship (GSBF) program, action research marshals key resources of the university, including critical thinking and expert knowledge, and applies them to the practical needs of social enterprises and the economically excluded communities they serve.

In the GSBF model, undergraduate students pursue action research projects with social enterprises. The students not only gain valuable in-the-field research experience, but they also provide valuable feedback to the social enterprises with which they work. The social enterprises can parlay the research to further scale their impact, attract investment, and move further toward their ultimate goals.¹²

In the Central American dry corridor, action research as an example of community-based participatory research is a powerful tool for generating the evidence that specifies which strategies and practices are likely to strengthen local institutions and build climate resilience, in response to different forms of climate disruption. Research results can then help guide or support the endeavors of locally-based social enterprises. In 2016, a team of interdisciplinary fellows, drawing from the replication framework developed by Miller Center, conducted research with a local institution, ASDENIC, to develop a proposal for launching a clean drinking water social enterprise.¹³

CONCLUSION



Initiatives in the Central American dry corridor are showing that social entrepreneurship and innovation practices, in coordination with interdisciplinary research through collaborative partnerships, can strengthen the ability of local institutions in high-risk regions to build greater climate resilience—i.e., to respond more effectively to the stresses of climate change and variability.

As one of the organizations working in this dry corridor region, Santa Clara University's Miller Center for Social Entrepreneurship accelerates entrepreneurship to end global poverty and protect the planet. Through its Global Social Benefit Institute (GSBI) programs, Miller Center helps social enterprises throughout the world to build capacity, become investment-ready, and eventually scale for widespread impact. And through its Global Social Benefit Fellowship (GSBF) program, Miller Center matches Santa Clara University students with GSBI-trained social enterprises to conduct action research that benefits all participants.

Miller Center is committed to scaling up its efforts in social enterprise acceleration and replication to continually increase its impact on boosting climate resilience and the economic empowerment of women, and alleviating poverty. In the Central American dry corridor in particular, Miller Center intends to increase the financial investment in social enterprises that are either already working within the region, or whose business models can be replicated within the dry corridor.

In addition, Miller Center and its Santa Clara University academic partners will expand its action research projects that link social enterprises with local institutions in the Central American dry corridor to build climate resilience—and to fully understand whether the desired resilience is being created. In the near future, Miller Center plans to work with 10 to 20 promising social enterprises—embedding them into local institutions and developing community-based research that will guide promising interventions to promote climate resilience. Based on the lessons learned among this group of social enterprises, the effort can be scaled out within the region.

We invite anyone interested in supporting this work to contact Chief Innovation Officer, Pamela Roussos (proussos@scu.edu) to learn more about Miller Center's community-based and action-oriented research, along with its social enterprise acceleration and scaling efforts, aimed at creating climate resilience in Central America's dry corridor.

ENDNOTES

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MEET THE AUTHORS



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