GLOBAL
CENTER ON
ADAPTATION

STORIES OF RESILIENCE

Lessons from Local Adaptation Practice

STORIES OF RESILIENCE

Lessons from Local Adaptation Practice

GLOBAL
CENTER ON
ADAPTATION

IUB

ICCCAD
International Centre for
Climate Change and
Development

Disclaimer

This work is a product of contributions from partners and the staff of the Global Center on Adaptation (GCA). The findings, interpretations, and conclusions expressed in this work do not necessarily reflect the views of GCA, its Executive Board, Supervisory Board, Advisory Board, or of any of its donors. The individuals mentioned herein contributed to the production of the report. Authors and reviewers contributed in their individual capacities and their affiliations are mentioned for identification purposes only.

GCA has taken all reasonable precautions to verify the information contained in this publication. However, the published material is being distributed without warranty of any kind, either expressed or implied. GCA does not guarantee the accuracy of the data included in this work. The responsibility for the interpretation and use of the material lies with the reader. In no event shall GCA be liable for damages arising from its use.

References to specific companies does not imply that they are endorsed or recommended by GCA, or that those companies are referred to in preference to others not mentioned.

The boundaries, colors, denominations, and other information shown on any map in this work do not imply any judgement on the part of the GCA concerning the legal status of any territory or the endorsement or acceptance of such boundaries.

The contributors have not endorsed nor are they responsible for the full content of the report.

Acknowledgements

Project Partners

Contributors

Funded By

Contents

Foreword

At a time when the world needs leadership like never before, I hope these stories of resilience in the face of climate change will inspire you to raise your voice, get involved, and hold the powerful to account.

At the global level there can be no doubt that we are failing to address with sufficient determination the existential threat now facing the planet and our species.

The latest forecast is that we are on track for up to 2.6°C temperature rise by 2100 – an outcome that is quite simply catastrophic. Countries' targets fall far short of the 45% cut in emissions needed by 2030 to limit global warming to the Paris Agreement's 1.5°C. And the fatal effects of global warming are already evident.

Going from global to local provides us with many lessons and examples of determination in the face of climate adversity. From the age of 17 Gita Roy

daily walked long distances to collect drinkable water for her family. After decades of hardship, she came together with other local women and, with newly acquired skills and tools that her local community petitioned for, gained a reverse osmosis water plant which they manage themselves.

This is just one of the stories of locally driven solutions to climate change through adaptation that you will find in the following pages. Vulnerable communities are not waiting for help to arrive. They are already finding and implementing solutions, but they urgently need our support.

They need funding, delivered locally, and with sufficient flexibility to target local priorities with locally appropriate solutions. They need information on climate risks, and technical support to find and implement solutions.

Targeting these urgent needs is a priority for the Global Center on Adaptation. Locally Led Adaptation (LLA) ensures that managing climate risks starts at the grassroots, delivers high returns on investment, and produces outcomes that are more equitable than 'business as usual' approaches.

This year we started work on establishing a Global Hub on Locally Led Adaptation, based in our regional office in Dhaka, Bangladesh, to actively work with partners to help us deliver on this agenda.

While inaugurating the Dhaka office, Her Excellency the Honourable Prime Minister Sheikh Hasina called on GCA to share best practices and experiences from Bangladesh and around the world,

to limit climate-related damage on poor and vulnerable communities.

This is what we aim to do through this publication, which documents some of the experiences shared at the 2022 Gobeshona Conference on LLA; and through our partnerships with organizations like the Independent University of Bangladesh, International Centre on Climate Change and Development, and others who have contributed to this publication. I want to thank them all.

Local leaders may not attract primetime attention. But if their actions inspire others to dream more, learn more, do more and become more, they are the leaders the world needs right now.

Prof. Dr. Patrick Verkooijen
Chief Executive Officer
Global Center on Adaptation

Introduction

At the core of the Principles for Locally Led Adaptation is *local leadership.*

Leadership is about people.

LLA is therefore about enabling people to take the lead, by providing them the information, capacity, and resources they need to deal with the additional challenge of climate change.

It is also about challenging norms of leadership, by empowering the traditionally excluded – the poor, women, youth, children, disabled, displaced, Indigenous Peoples and marginalized ethnic groups. For them, the challenges brought on by climate change are additional to the considerable daily struggles that they must already contend with. To be effective in reducing this additional burden, we must support them to lead in finding solutions that are best suited to their circumstances.

It is about Gita Roy from Satkhira, Bangladesh, whose *Golap Mohila Dal* (Rose Women's Group) broke cultural barriers to find a solution for her community's water scarcity problems and set up the Moricchap Drinking Water Plant; and who continues to inspire other young women to take on roles that were traditionally in the male domain (Chapter 1).

It is about Gift Kasamila from the Lilongwe City Council in Malawi, who recognizes the power of communities in developing their own solutions, and who, together with the Malawi Alliance and residents of informal settlements in Lilongwe, redefines what effective partnerships between governments, communities, and non-government organizations can look like (Chapter 2).

About Asma Begum from Kanthalpara, Bangladesh, learning new skills, including how to run a business, to feed her family in the aftermath of repeated disasters (Chapter 3).

About Mbali Mitshali, a Master's student from KwaZulu-Natal, South Africa, who helped find ways to deal with chronic flooding in an informal settlement in Durban, as part of an innovative collaboration between communities and institutions of higher education (Chapter 6). She hopes one day to do the same in her hometown, Howick.

And about Hamidou Barry, from Kudang, The Gambia, whose plans for a better life through education were thwarted by drought but have been revived by a Cash for Work program that helped him install solar pumps (Chapter 7).

The stories in this compilation, based on the sessions of the 2022 Gobeshona Conference on LLA, are an important basis for us to understand the difference between local action and locally *led* action, and to identify effective ways of supporting local leadership. They form the basis for us to understand where we are, how much further we must travel, and in which direction, to mainstream and scale up truly locally led adaptation.

We still have a way to go. Key barriers include the limited funding for local

leaders to truly innovate or implement solutions, and capacity constraints at the local level. The latter is often attributed to the former – that local actors lack the capacity to use climate finance effectively. But unless innovative ways are found to channel funds from the global and national levels to the local level, and to invest in local capacity, these constraints will never be overcome. The experience of the Adaptation Fund in the Federated States of Micronesia (Chapter 8), and of LoCAL in several countries around the world (Chapter 7) clearly demonstrate how we can innovate to prioritize the funding needs of the most vulnerable.

The Adaptation Fund's deliberate efforts to identify and invest in "small" National Implementing Entities, support peer-to-peer learning, and encourage national Small Grants Facilities are worthy of emulation by all resource providers, from global to national. LoCAL's efforts to strengthen national systems to channel climate finance to the local level have helped to attract further investments, as capacities are built, and resource providers are reassured that systems to target priority needs, and to monitor progress, exist at the local level.

Scale and Speed

As the Global Center on Adaptation worked towards the launch of its Global Hub on LLA over 2022, our mandate, received from the Global Commission on Adaptation and the Practitioner Roundtables we organized, was clear: to deliver locally led adaptation at scale, with speed. The piloting and modelling of ways to devolve and decentralize action,

mobilize communities, and build social capital has already been done in past decades, in the context of development. Instead of fragmented pilots and models, the focus now needs to be on joining the dots for urgent and scaled up adaptation action.

Through the year, therefore, we have worked to identify LLA best practices, and pathways to scale.

To seek out best practices to scale LLA, we launched the Local Adaptation Champions (LAC) Awards and a Call for Partnerships for LLA practitioners. The response we received for the LAC Awards was so impressive that we had to upgrade our web servers to accommodate 2.3 million visitors – indicating the level of effort on adaptation at the local level. The responses to the Call for Partnerships, meanwhile, indicated the level of need. They also showed the complete openness of adaptation practitioners at every level to collaborate for bigger impact.

Our challenge now is to find bigger investment opportunities to scale the most effective LLA best practices. We have already started making some progress in this direction, towards integrating LLA best practices into larger investments by international financial institutions.

For instance, we were inspired by the work in Mukuru, an informal settlement in Nairobi, Kenya, where a local planning process strongly demonstrates the power of the community and collaborations. Once communities were convinced that the solutions to their problems lie in working effectively together, and that

the local government is on their side, the residents of Mukuru developed a People's Plan. In their effort, they received coordinated (rather than fragmented) support from the local government, NGOs and academics. Instead of working in their usual sectoral silos, the local government, NGOs and academics acknowledged the interconnectedness of challenges. It is impossible to address issues of flooding, for example, without also addressing waste management, water, sanitation, and health. The result was an integrated, rather than sectoral, People's Plan for Mukuru.

As in Lilongwe (Chapter 2), the local government is funding the implementation of some of the activities of the People's Plan in Mukuru. Local governments themselves lack capacity and resources, as Gift Kasamila from Lilongwe County Council astutely notes, and need the extra support of communities and non-government actors – as equal partners – in order to be more effective.

Recognizing the game changing potential of this approach in reducing local climate vulnerability of an overlooked but very climate vulnerable community (residents of urban informal settlements), the GCA is identifying further opportunities to scaling it up through urban development projects implemented by international financial institutions, and in partnership with local governments. The GCA's role is that of an enabler, facilitating peer-to-peer learning between the practitioners in Mukuru and leaders in other urban informal settlements, while seeking opportunities to leverage investments.

Our efforts in scaling up already show clearly that it is not a question of taking

a best practice and offering it as a ready-made solution to another community. Not only because countries and contexts are different, but also because the journey of arriving at a locally-owned solution is critical. What worked in Mukuru may not even find success in another informal settlement in the same city of Nairobi despite the common political, social, cultural and economic circumstances, *because it was not born out of a journey of local understanding and co-creation.*

That unique journey is important. Experiences and approaches from elsewhere can inspire and inform. For the rest, local leadership and local leaders are important, to adapt, and to navigate, very specific local contexts and achieve local buy-in and ownership. In a true test of effective LLA action, local leaders were born out of the Mukuru planning process – community mobilizers who went on to become candidates for local office like Gita in Chapter 1, and to secure jobs in government and non-government organizations.

Measuring Progress Toward the Global Goal on Adaptation

The stories in this compilation deserve to be told – not just to inspire action elsewhere, but also to document the additional effort required by the poor and marginalized to meet basic needs in a climate compromised world. Developing countries wanted a Global Goal on Adaptation (GGA) to document the level of effort and resources they, and their citizens, are forced to commit to adapt to

climate change. It is through the voices of Gita (Chapter 1) and Asma Begum (Chapter 3) that we can truly understand the scale of this effort, and on whom the onus falls.

It is important that attempts to aggregate progress to measure progress on a Global Goal on Adaptation don't efface these individual stories of progress and struggle. As Chapter 9 notes, quantitative metrics, indicator-based tools, and impact assessment frameworks have their limitations, especially in data scarce local environments. Instead, stories of lived experiences, processes of adaptation, and co-production of knowledge are necessary to capture nuances in change, and to track progress.

This "citizen science" can address issues of data scarcity and of downward accountability. At the same time, the process of learning and feedback into policy and research through citizen science can challenge existing structural inequities within LLA initiatives and empower the traditionally marginalized. Modern technologies can help overcome many of the barriers of citizen science and engagement in monitoring progress on Local, National and then finally Global Goals on Adaptation, in ways that can actually inform timely course correction at each level.

Clearly, adaptation to climate change is not only about more climate resilient "hardware" – adapting infrastructure or systems to cope better with extreme weather. It is equally about the "software" – adapting and redesigning global, national, and local institutions, processes and ways of doing business, some of which are deeply ingrained habits and hardened preconceptions, to a new climate reality that demands local leadership, along with flexibility and nimbleness, to deal with uncertain futures.

Investing in long-term social capital at the local level – in ways that can be institutionalized and sustained in the long term through the provision of adequate resources – is one of the best strategies we have, to minimize the impacts of climate change on the poor and vulnerable.

Principles for Locally Led Adaptation

The eight LLA Principles were developed by the Global Commission on Adaptation and launched at the 2021 Climate Adaptation Summit, to guide efforts to promote LLA.

1 Devolving decision making to the lowest appropriate level: Giving local institutions and communities more direct access to finance and decision-making power over how adaptation actions are defined, prioritized, designed, implemented; how progress is monitored; and how success is evaluated.

2 Addressing structural inequalities faced by women, youth, children, disabled, displaced, Indigenous Peoples and marginalized ethnic groups: Integrating gender-based, economic, and political inequalities that are root causes of vulnerability into the core of adaptation action and encouraging vulnerable and marginalized individuals to meaningfully participate in and lead adaptation decisions.

3 Providing patient and predictable funding that can be accessed more easily: Supporting long-term development of local governance processes, capacity, and institutions through simpler access modalities and longer term and more predictable funding horizons, to ensure that communities can effectively implement adaptation actions.

4 Investing in local capabilities to leave an institutional legacy: Improving the capabilities of local institutions to ensure they can understand climate risks and uncertainties, generate solutions, and facilitate and manage adaptation initiatives over the long term without being dependent on project based donor funding.

5 Building a robust understanding of climate risk and uncertainty: Informing adaptation decisions through a combination of local, traditional, Indigenous, generational and scientific knowledge that can enable resilience under a range of future climate scenarios.

6 Flexible programming and learning: Enabling adaptive management to address the inherent uncertainty in adaptation, especially through robust monitoring and learning systems, flexible finance, and flexible programming.

7 Ensuring transparency and accountability: Making processes of financing, designing, and delivering programs more transparent and accountable downward to local stakeholders.

8 Collaborative action and investment: Collaboration across sectors, initiatives and levels to ensure that different initiatives and different sources of funding (humanitarian assistance, development, disaster risk reduction, green recovery funds, etc.) support each other, and their activities avoid duplication, to enhance efficiencies and good practice.

Photo Credit: WaterAid/ Drik/Farzana Hossen

Chapter 1
The *Golap Mohila Dal*'s Moricchap Drinking Water Plant

KEY MESSAGES

- Strengthening the resilience of water, sanitation, and hygiene (WASH) systems is not only about building infrastructure to withstand cyclones or tidal surges, but also about leadership and ownership by local communities; strong and inclusive government leadership; well-functioning and accountable institutions; and strategies to tackle gender and social inequalities.

- Building trust, a key ingredient for successful adaptation, is a long-term process. This can be facilitated by working with local organizations who already have good relationships with the community. Long-term local institutional capacity building can also be strengthened in this way.

- WASH provision can reduce internal migration, and promote leadership and entrepreneurship by vulnerable groups. This leadership and entrepreneurship, meanwhile, can change perceptions on traditional roles in society, and inspire others.

Devolved decision making

Addressing structural inequalities

Patient, predictable, accessible funding

Investing in local capacities

Building understanding

Monitoring, evaluation, and learning

Transparency and accountability

Collaborative action

Gita Roy was 17 when she was married in 2001, and moved to her husband's village, Tengrakhali in Satkhira, Bangladesh. Located near the confluence of the Ganges and the Bay of Bengal, Tengrakhali has 941 inhabitants clustered on a flat, low-lying area where many streams and water channels, known as *khals*, snake through the plains. The weather is hot and humid, the water and soil saline, and the area is susceptible to disasters, as is typical of the region.

Gita took on the laborious responsibility of walking a long distance every day, to fetch water for her family of 14. Safe and clean drinking water is becoming increasingly difficult to access in Bangladesh. Frequent and intense cyclones, storm surges, and sea-level rise, particularly in the coastal belt, result in water logging, and drive salinity further inland.[1]

River and groundwater salinity currently affects 105 million hectares of land in Bangladesh.[2] Climate change is not the only reason, however. Past attempts to adapt to climate change have worsened the salinity problem, resulting in maladaptation. Forty years ago, agriculture and livestock farming were the mainstay in Satkhira. After rising salinity levels caused grazing land and fodder shortages in the 1980s, communities converted agricultural land into shrimp and crab aquaculture farms.[3]

Once hailed as a breakthrough in alternative livelihoods, this practice led to further water contamination. Salt water was pumped into the shrimp farms (*ghers*), along with low quality feed that introduced suspended nitrates and other pollutants into the water.[4] Salinity spread like a cancer, and pollutants contaminated local water supplies, making them undrinkable and unsuitable for agriculture. Bangladesh's Soil Resource Development Institute recorded soil and water salinity rising across the entire southwest coastal

region, including Tengrakhali.[5] Now, sea-level rise continues to increase water salinity, further affecting the livelihoods and health of local communities.

In 2019, WaterAid Bangladesh examined 57 public and private ponds in Satkhira

Assasuni Upazila (Sub-District)

Bay of Bengal

KULLA

DURGAPUR

KADAKATI

BUDHHATA ● **Tengrakhali**

SOBHNALI

BARADAL

ASSASUNI

KHAJRA

SREEULA

ANULIA

PRATAP NAGAR

N

0   5 mile
0   5km
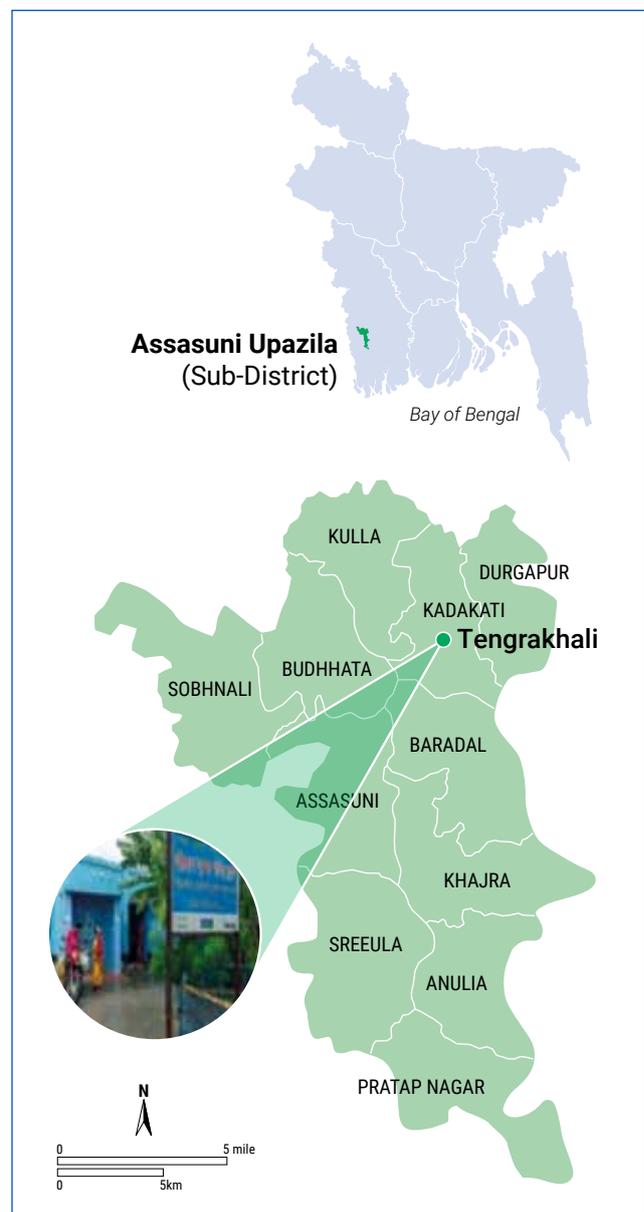
and found 28% unusable for any purpose due to high salinity levels. 44% were unsuitable for drinking, but could be used for bathing, cooking, and other household uses.[6] Only 28% of the ponds met drinking water standards set by the World Health Organization and the Bangladesh Department of Public Health Engineering. While the safe level is less than 300 milligrams per liter (mg/l) of sodium, levels in some ponds were as high as 390 to 8,000 mg/l.[7]

Those who could, paid for the water to be transported to them on three-wheelers. The poor residents of Satkhira meanwhile had a choice between drinking contaminated water and getting sick, or walking several kilometers, like Gita, to get clean water while learning to make do with less. Those who chose to drink saline water, especially outside the monsoon season, were found to have average sodium levels of 3.4 g/day in their urine, exceeding the recommended maximum of 2 g/day.[8] This caused a higher incidence of pre-eclampsia and eclampsia among pregnant women, causing abortions.[9] The lack of clean water, meanwhile, caused a high incidence of waterborne diseases among families who could ill afford healthcare.

After nearly 20 years of walking a long distance every day to fetch water, Gita heard about the water, sanitation, and hygiene (WASH) initiatives of WaterAid and Rupantar, a local NGO. WaterAid has been working on providing WASH services for the poor in Bangladesh since 1996. Since 2011, the organization has focused on climate resilient WASH services, recognized as a low-regret adaptation

measure by the Intergovernmental Panel on Climate Change.[10]

WaterAid and Rupantar had received funding from Severn Trent Water, UK, in 2019 to provide water services to 100,000 people in five communities in Satkhira. Their interventions offered reverse osmosis drinking water plants to purify or desalinate salt water by pumping it through a semi-permeable membrane. These plants can purify up to 500 liters of saline water per hour, producing around 1,000-4,000 liters per day.

While the use of reverse osmosis plants was not new along the coastal belt of Bangladesh, they often did not last long because of lack of maintenance. WaterAid and Rupantar recognized the need to build the capacity of community members to operate and maintain the plants; ensure spare parts were available locally; and make manufacturers and suppliers take more responsibility for major repairs through longer warranties.

Thus the Water Entrepreneurship for Women's Empowerment (WE-WE) initiative was launched, focused on training vulnerable groups, particularly women, to manage the water treatment plants. The WE-WE approach recognizes that providing infrastructure that will withstand a cyclone or tidal surge alone is not enough for resilience in the WASH sector. Climate-resilient WASH services need an accompanying "WASH system" with strong government leadership, well-functioning and accountable institutions, sufficient finance, reliable data and updated plans, active and empowered people, and measures to address deeply ingrained gender and social inequalities.

Gita reached out for help to WaterAid through Rupantar, to improve her community's water situation. In response, WaterAid initiated a preliminary participatory assessment to gather insights from a range of local stakeholders, differentiated by gender, age, and position within the community. The assessment identified WASH-related vulnerabilities in the area, appropriate interventions, type and frequency of climatic events, sectoral vulnerabilities, and socioeconomic conditions.

In addition to a traditional institutional mapping, community members mapped their own surroundings, based on socioeconomic status, well-being rankings, and the WASH situation of households, to identify vulnerable families in their community. The assessment in Gita's community identified the lack of drinking water, poor sanitation, lack of jobs, lack of river embankments, and high soil and water salinity as priority challenges.

Gita and a group of other affected women lobbied their community heavily for a reverse osmosis plant managed by women to address water shortages. At first, the men resisted the idea. In Bangladesh, many women need permission from male family members to work outside the home, particularly in rural areas like Tengrakhali. Many men did not think women should take on a managerial or leadership positions. While women can work in shrimp farms besides their husbands, leading and managing a reverse osmosis plants went beyond traditional expectations. Men were also opposed because no jobs would be created for them. It took months for

the women, supported by WaterAid and Rupantar, to convince the community to agree to the plant.

Once agreement was reached, an assessment was conducted to ensure that the plant would not worsen salinity levels in the area. The groundwater source for the plant had chloride/salinity levels of 20,000 mg/l, while the waste brine released after treatment was around 25,000 mg/l. The waste brine would be released into a water canal, where the salinity levels were 50,000 mg/l or more around the year – double the salinity of the waste.

Moricchap Drinking Water Plant

As a first step, a women's group was established to manage the water plant. Gita led the formation of a group of five women, who called themselves the *Golap Mohila Dal* (Rose Women's Group). WaterAid and Rupantar helped the *Golap Mohila Dal* register as a business and sign a formal agreement with Rupantar. Rupantar would provide training to maintain and operate the plant, and the women would be formally responsible for running it. While the plant was being constructed, the members of the group received training on operating and maintaining it. This included training in marketing, and planning operational teams.

A trade license was obtained from the Department of Environment; and an electricity connection was obtained from the village electricity supply committee. The members of the *Golap Mohila Dal* pooled funds to obtain a 15 year lease for a parcel to construct the plant.

Once these administrative steps were completed, WaterAid and Rupantar developed the technical design of the reverse osmosis plant and initiated construction through a formal procurement process in November 2019. WaterAid covered the €14,500 capital costs for construction, while *Golap Mohila Dal* contributed 20% (about €2,888) for an operation and maintenance (O&M) fund, and for the land lease.

The O&M fund was critical for the sustainability of the plant. The women's contribution demonstrated their ownership of the project. Each member contributed €158, collecting €790 in total. Some dug into their savings, while others had to take loans to cover their share of

the 20%. *Golap Mohila Dal* decided that the first profits from water sales, after covering basic costs, would replenish the O&M fund. Once that was completed, 20% of the profits would cover caretaker salaries, while the remaining profits, saved in a business bank account, would be split evenly between the five key members. It was agreed that no profits would be shared during the first six months to ensure the smooth running of the plant.

As construction continued, the group set up a trust-based social solidarity governance structure for the plant and defined key roles such as plant management, operations, and financial management. These positions were filled by nominations or voting. Gita was

Photo Credit: WaterAid/ Drik/Farzana Hossen

Members of the *Golap Mohila Dal* tending to business.

appointed President, and other group members were appointed to the posts of treasurer and caretakers based on their education levels or experience working with other income generating activities. Rupantar trained the women in their different roles.

The Moricchap Drinking Water Plant officially opened in February 2020. The residents of Tengrakhali village finally had uninterrupted water supply, and could buy clean water for €0.005 per liter – without additional transportation costs. The *Golap Mohila Dal* went door-to-door to advertise and register interested households as clients. As an incentive, registered clients received a further discounted price, allowing even financially constrained families to buy enough for their daily needs.

The COVID-19 pandemic struck shortly after the plant opened. Special precautions were introduced to safely provide residents with water for drinking – and critically, for basic hygiene. A 24-hour water supply was maintained despite a national lockdown. Women and children could access water closer to home, and hence reduce exposure. Patients suffering from diarrhea and gastroenterological illnesses were prescribed water from the Moricchap Drinking Water Plant, resulting in a lower incidence of water-borne illnesses, and savings on medical costs (up to €80 per month).

Soon *Golap Mohila Dal* was selling enough water to make a good profit. During peak summer months, the plant often worked around the clock, selling up to 4,200 liters of safe drinking water for up to €21 daily. Appreciating how difficult

it is to live without clean, safe and affordable drinking water, *Golap Mohila Dal* keeps water prices stable, even during periods of high demand.

Within the first year, there was enough profit to refund the initial 20% contribution to the O&M fund. The Dal has used the fund for maintenance when needed, and topped it up to its initial reserve amount, each time demonstrating their ability to successfully operate and maintain the plant. "As shareholders, we have been putting money in the O&M fund since the first day, as we had a target to reach," says Jayanti, a caretaker of the plant.

Between April 2021 and March 2022, the plant generated €1,900 in sales, with €750 in profit. The profit helped *Golap Mohila Dal* members to support their families, and send their children to school. The women also opened savings accounts for more financial security. The services of the Moricchap Drinking Water Plant extend to eight surrounding villages, and the *Golap Mohila Dal* has plans to build another reverse *osmosis plant to serve* more villages in future.

The Moricchap Drinking Water Plant has also had far-reaching impacts within the community in a variety of ways. Access to reliable drinking water has reduced out migration. Women are accepted as leaders within the community. The caretakers often spend time beyond their shift tending to the machinery to ensure everything operates smoothly. This dedication has added to the community's appreciation of the women's leadership abilities and commitment to their work. "All the villagers rely on our plant for drinking water," says Jayanti.

"We are treated with respect and warmly welcomed everywhere we go. This is something that money cannot buy." The strong female role models have also resulted in reduced gender discrimination.

There are individual stories of empowerment that have strengthened social resilience. Jayanti, for instance, used her portion of the profits to buy a sewing machine and provide tailoring services to the community. She runs the additional business to support her family, showing how skills development and capacity building contribute to social resilience beyond the scope of the project.

Gita has become even more active in the community. In 2022, she stood for elections on the Kadakati Union Parishad – the local council, responsible for local development. Known for her hard work and determination, she won the election, defeating her rival by more than 1,000 votes. Gita's dream of finding ways to improve the lives of her family and village continues to come true and to grow.

"As a woman, I want to keep working to empower deprived women to have more control over their lives," she says. "Having my own identity, earning my own income, and not depending on anyone for my needs is very satisfying. It's time for women to stop confining themselves and their potential within their households only."

Lessons for LLA

The WE-WE approach has been implemented in 12 other areas along the south-west coast of Bangladesh, in Assasuni, Shyamnagar, and Dacope. It provides lessons on devolving decision making to the lowest appropriate level (Principle 1); addressing structural inequalities faced by women (Principle 2), and investing in local capabilities to leave an institutional legacy (Principle 4).

Devolving Decision Making

A primary principle in the WE-WE approach is the use of inclusive participatory methods to identify key challenges, and solutions. WaterAid and Rupantar facilitated a participatory community assessment for community members to compile information, and prioritize critical problems and possible solutions. Decisions were made by the community members.

In particular, the approach engages with women, usually initiating engagement through microfinance or income generating activities, before starting community mobilization. Focus group discussions the take place with the women's groups to understand their needs, motivation, and willingness. These actions ensure that ownership resides with the women's groups from the very beginning of the process.

Addressing Structural Inequalities

In addition to being a mechanism that enables women to lead, the participatory assessment process supports the community to identify other vulnerable groups in the community; and sensitize them to their needs. This approach makes service provision more accessible to community members who may previously have been ignored.

Convincing people that women should lead is not straightforward in rural Bangladesh, where running a business is considered a man's job. Women often need permission from male family members and community elders for what are considered "unusual" activities, such as going to school or running a business after marriage. Women often lack skills for income generating activities because they do not normally manage finances, or have not been employed before.

The WE-WE approach contributes to breaking down these structural inequalities by placing women in the center of development. Women are trained in business management, and in operating and maintaining equipment. They learn critical skills such as how to get a business license, and how to manage budgets. In addition, placing women in strong leadership and decision-making roles erodes systemic cultural barriers that perpetuate gender inequality.

Although women in Bangladesh have the legal right to purchase and own land, this right is often not practiced in rural areas. Leasing land, engaging with government departments to get trade licenses, dealing with electricity providers, managing finances, operating and maintaining machinery – all these actions give women the opportunity to assume roles usually filled by men, and to break cultural taboos and structural inequalities.

Investing in Local Capabilities

The WE-WE approach focuses on the role of women in building community resilience. When they move on to the next opportunity, they train other women to step into leadership roles. In the case of the *Golap Mohila Dal*, the women have plans to build another reverse osmosis plant, and to train other women to run it, without any assistance from Rupantar or WaterAid.

Capacity development creates broader social resilience beyond the scope of the project. As women earn profits, they are able to use these funds to send their children to school or start a new businesses. Leadership skills give the women the confidence to engage in new ventures, such as assuming leadership roles.

Partnerships with local NGOs such as Rupantar also build institutional capacity of local organizations to engage in other resilience building activities, in addition to providing authentic access into the community.

Conclusions

The WE-WE approach demonstrates how the provision of drinking water services can enhance the resilience of vulnerable communities fin multiple ways. It provides a road map to create a financially sustainable WASH adaptation project for a small rural community, often dismissed as nonviable, and demonstrates that empowering women can change an entire community for the better.

Cultural taboos and restrictions related to actively involving women in leadership roles was a key challenge. This was overcome through the support and advocacy provided by Rupantar, to enable the women to convince elders and the

community. The endorsement from the government through the provision of a business license, and the ability of the women to maintain and operate the plant at a profit, also helped to overcome it.

Procuring loans for the women proved another challenge. They came from ultra-poor families, that even microfinance institutions consider as high risk. As a registered business, however, the *Golap Mohila Dal* was able to access loans.

The trust of communities is hard-won, and takes time. When planning locally-led adaptation activities, donors and organizers must be realistic and factor in time for trust-building and establishing relationships with local NGOs and others who have the trust of the community. All planning must be based on the insights and experiences of communities and their trusted local partners.

The sustainability of the approach is strengthened by establishing an O&M fund to overcome early challenges that have caused other reverse osmosis plants to close down. The women's contribution to the O&M fund reduced this risk and at the same time strengthened ownership of the plant.
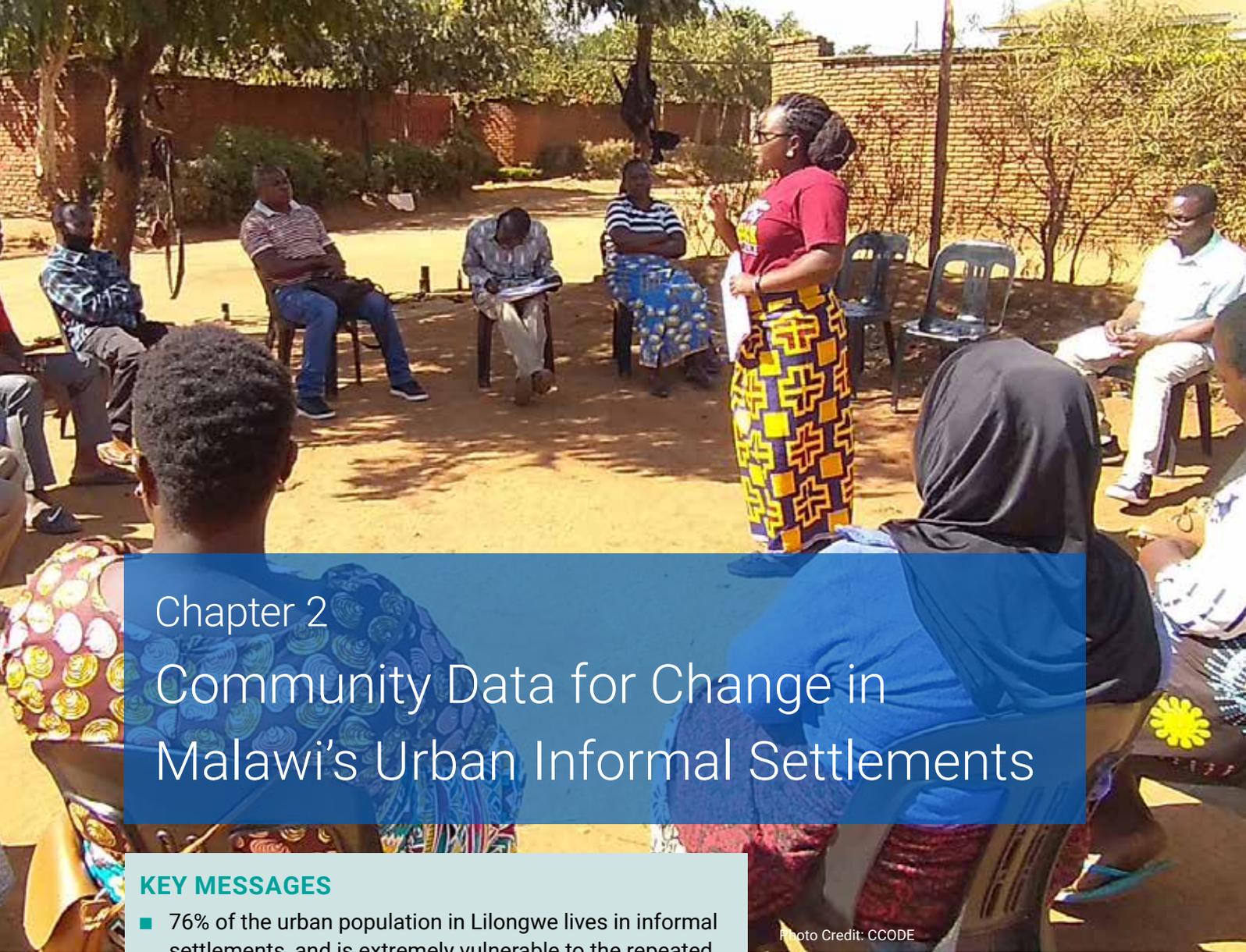
Photo Credit: CCODE

Chapter 2
Community Data for Change in Malawi's Urban Informal Settlements

KEY MESSAGES

■ 76% of the urban population in Lilongwe lives in informal settlements, and is extremely vulnerable to the repeated storms and cyclones that have battered Malawi in recent years.

■ The processes of community-led data collection, profiling, mapping, and planning in urban informal settlements empowers residents to understand their challenges, come together as a community, and negotiate more strongly with resource providers.

■ After residents of urban informal settlements developed Community Resilience Plans, the Lilongwe County Council established a Ward Development Fund to support implementation.

■ Managing community expectations remains the biggest challenge in community led efforts. Communities who participate in the process expect that it will be followed up with investments for implementation. This does not always happen.

Devolved decision making

Addressing structural inequalities

Patient, predictable, accessible funding

Investing in local capacities

Building understanding

Monitoring, evaluation, and learning

Transparency and accountability

Collaborative action

The urban poor in Malawi face cyclones, storm surges, heat stress, extreme precipitation, flooding, landslides, drought, and water scarcity with increasing regularity as climate change escalates.[11] **The country was still recovering from the effects of the 2019 Cyclones Idai and Kenneth, when it was hit in quick succession by tropical Storm Ana and Cyclone Gombe in 2022, and battered once again by heavy rains, strong winds, and flooding.**

In the capital city of Lilongwe, where 76% of the urban population lives in informal settlements, the storms and cyclones caused tremendous damage – particularly in the informal settlements in the Kaliyeka, Mchesi, Kawale and Mtandire wards.[12] In Kawale, for instance, over 569 people were rendered homeless, the majority (307) female, and what little existed by way of water and sanitation facilities was destroyed.[13]

These kinds of climatic shocks are expected to increase in severity and frequency in future.[14] At the same time, the urban population in Malawi, which rose from about 850,000 in 1987 to 2.8 million in 2018, continues to increase at a rate of 5.2% annually.[15] This is a high rate of urbanization, compared to a national annual population growth rate of only 2.8%, and contributes to the proliferation of urban informal settlements.

Although "informal settlements" lack a precise definition, the Organization for Economic Co-operation and Development defines them as "*areas where groups of housing units have been constructed on land that the occupants have no legal claim to or occupy illegally, and where housing is not in compliance with current planning and building regulations*".[16] Residents of informal settlements often occupy marginal derelict land, such as hill slopes and flood prone areas; and live in sub-standard housing without adequate

access to basic urban services such as water, sanitation, or waste collection; or to risk-reducing infrastructure such as paved roads, storm and surface drains, and healthcare and emergency services.[17] This, in addition to their poverty, political

Lake Malawi

Lilongwe

Lake Chilwa

Lilongwe

Mtandire ●

Mchesi ● ● Kaliyeka

● Kawale

N

0 — 5 mile
0 — 5km
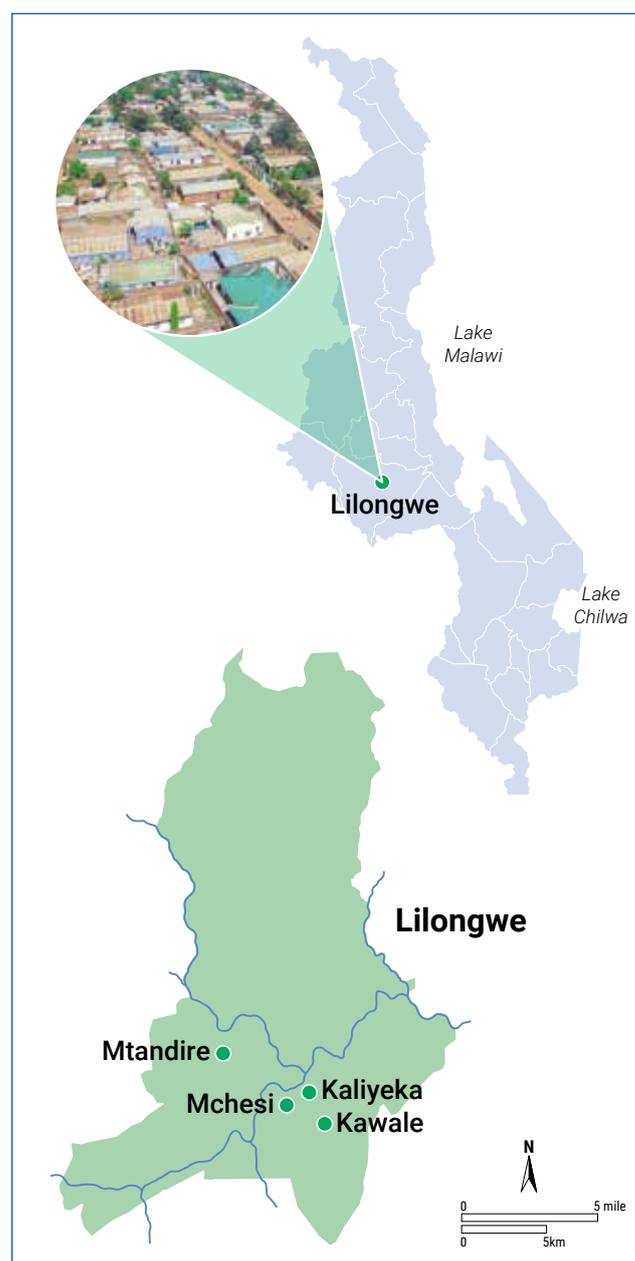
marginalization, and lack of information, knowledge and resources, results in a lower capacity to respond and adapt, and renders them at increased risk from climate change impacts.

The Malawi Alliance, which works to create awareness about climate risks, strengthen local infrastructure, and support community-led monitoring and evaluation to ensure accountability, was created by two organizations: the Center for Community Organization and Development (CCODE) and the Federation of the Rural and Urban Poor (FRUP). CCODE empowers local organizations of the poor in Malawi to be economically self-reliant through capacity building initiatives. FRUP is a grassroots network of poor communities in Malawi that promotes community savings programs, and supports them on tenure security, access to basic services, and economic self-reliance. Both organizations are affiliated with Slum Dwellers International (SDI).

The Malawi Alliance initially supported resilience building efforts in seven informal settlements between 2018-2020: Nancholi and Ntopwa in Blantyre City; Kawale, Mtandire and Mgona in Lilongwe City; and Salisbury lines and Ching'ambo in Mzuzu City. The work has since been scaled up to settlements in an additional 22 wards in the country. In Lilongwe, these include Chilinde, Tsabango 1 and 2, Kaliyeka, Mtsiriza, Chinsapo 1 and 2, Mvunguti, Mgona Chatata, Ngwenya, Phwetekere, Maria, Nyama, and Area 22. In Mzuzu, they include Chibavi East and West, Zolozolo East, Mchenga Utuba, and Masasa. In Balalntyre, they include Ndirande Matope, Mbayani, and Ndirande Makata.

In these wards, the primary strategy of the Alliance reflects an approach developed by SDI based on experience in several countries across Africa and Asia. Called Community Data for Change (CDfC), the approach empowers communities to generate data about their communities through community-led profiling, mapping, and enumeration. "The motivation to work in informal settlements emanates from our realization of the transformative power of communities, when they are fully aware of their challenges, and of the options to address them," says Zilire Luka, CCODE Executive Director.

The CfDC Approach

Under the CfDC approach, poor communities are mobilized and organized to collect and validate data about their vulnerabilities, risks and needs. This information does not usually exist for informal settlements, making the planning of interventions difficult. Peer to peer exchange and stakeholder engagements follow, to map findings (see Figure 1), and develop Community Resilience Plans or Risk Management Frameworks.

In Lilongwe, for instance, community mobilization efforts centered on raising awareness about climate-induced disasters and their impacts on the lives of people, aimed at building a critical mass of organized urban poor to influence authorities and service providers.

After mobilization, young people and community leaders were trained in community-led data collection and analysis, including through the use of

Figure 1: Risk map developed by the community in Mgona
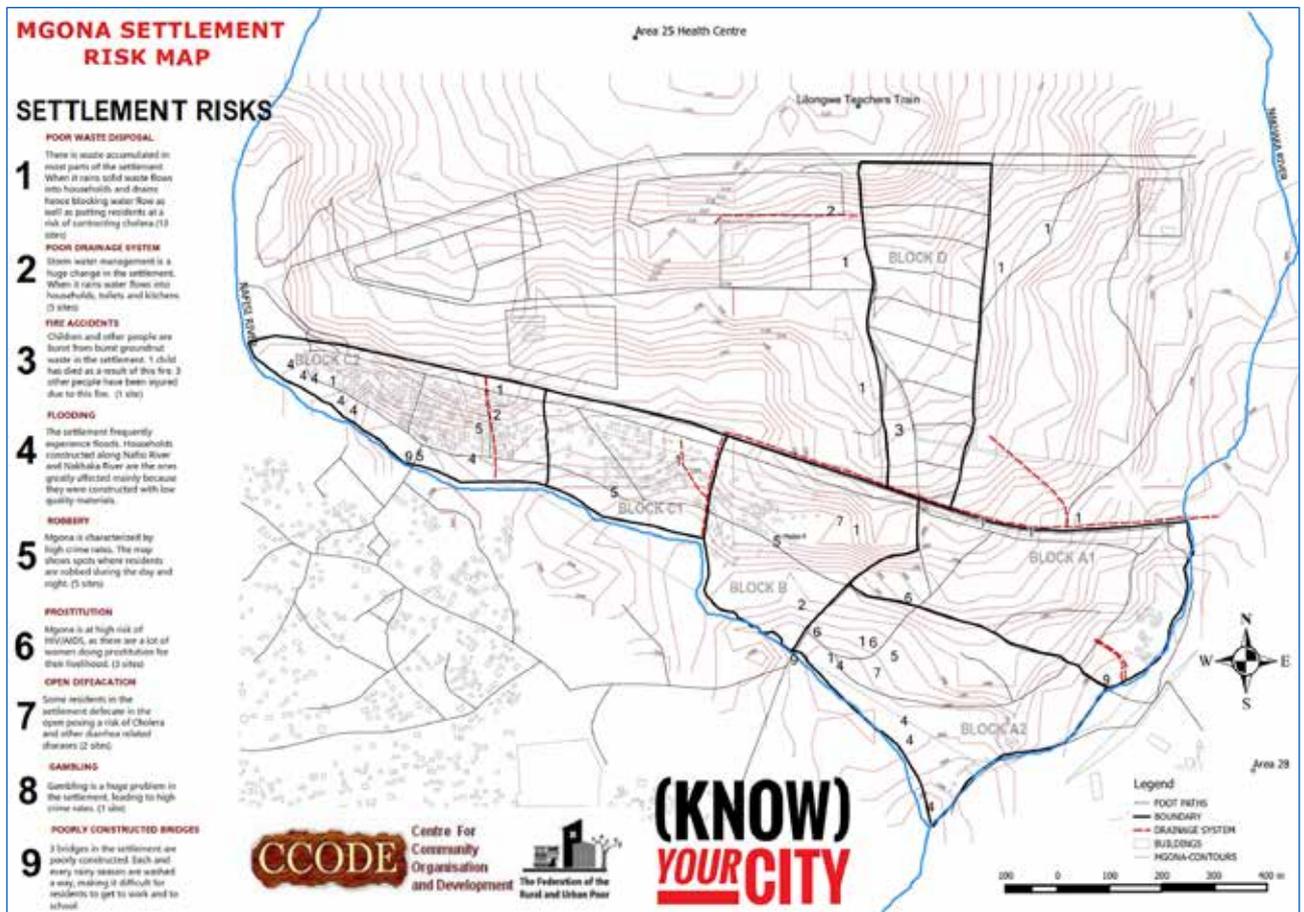
technologies such as Global Positioning System (GPS) to map and identify areas of high risk, and Kobo Toolbox, an open-source software to collect and analyze data in real time.

The process of data collection, dissemination, and analysis that followed was grounded in the participation of communities. Fifty community members from each settlement were then involved, along with Lilongwe City Council (LCC) and other key stakeholders, in co-producing knowledge to understand and map climate risks and vulnerabilities in each settlement, and produce Community Resilience Plans and Risk Management Frameworks.

An adaptive cycle of action and critical reflection was employed, to build capacity and understanding over time.[18] Community meetings took place regularly. Existing community governance structures were the entry point into the community. For example, existing Ward Civil Protection Committees served as a key point of contact between the community and the government. Community members gained skills and knowledge to lead on climate adaptation and disaster risk reduction efforts, through training workshops. In addition to technical information, local knowledge was reflected during the process of data verification and analysis by communities.

The participatory analysis process provided key insights into the local drivers of climate vulnerability. For instance, it highlighted the extreme vulnerability of individuals living in houses made from flimsy building materials; and the importance of solid waste management in managing flooding to reduce the vulnerability of residents during storms. In Mtandire, for instance, the data collection and analysis process revealed that the majority of the houses (65%) affected during the extreme events of 2019 and 2002 used temporary building material, 28% used semi-permanent building materials, and 7% used permanent building materials like cement and baked bricks. The damage to most of the houses built with temporary material was non-repairable.[19]

Findings such as these have helped communities understand their collective risks to hazards, and at the same time identified individuals and households that are the most exposed and vulnerable. Collective understanding has helped overcome denial and apathy, infusing a new energy to solve problems as a community and creating buy-in and support for solutions. It has helped anchor community dialogues on resilience-building, and support conversations with local authorities and external agencies.

In Lilongwe, for instance, multiple actors, including LCC, the Department of Disaster Management Affairs (DoDMA), the Lilongwe Water Board, civil society organizations and others, have come together to form partnerships to support the communities in managing climate risks and in sourcing finance. Community resilience plans drawn up through the data collection and analysis process have

became blueprints for community-led processes to enhance resilience, and important tools to negotiate support from funders.

The outputs of the data collection, analysis and resilience planning processes are invaluable for local governments. While city councils are mandated to involve communities in disaster risk reduction plans, they face several challenges such as inadequate funding and lack of capacity. The project helped overcome these challenges and promoted genuine relationships between communities and government, where each helped the other to overcome gaps, while enhancing government accountability and sustainability.

 "LCC believes that the most effective way to fight climate change disasters is to empower communities to develop sustainable responses to mitigate risks," says Gift Kasamila, Deputy Director, Department of Planning and Development, Lilongwe City Council. "As such, partnering with the Malawi Alliance has simplified our work."

Not everyone in government was willing to act on data collected by communities, however, leaving gaps in funding for the provision of basic services and infrastructure. Most of the funding for the project came from the Swedish International Development Cooperation Agency (SIDA), the Urban Poor Funds (UPFs), and UN Habitat. UPFs are basket funds established by SDI to support the aspirations of organized communities to improve their immediate surroundings and create new development opportunities for themselves.[20]

The communities themselves contributed to the implementation of activities through financial contributions to Community Managed Funds, through their time, and by providing venues for community activities. The Community Managed Funds were established with contributions from community members to empower them to take control of their development agenda; support precedent-setting projects; provide leverage to negotiate with local governments to secure financial and other resources; and to channel state funds for community-managed development. While their governance is supported by a manual to ensure transparency and inclusion, they can only support small projects due to their small size.

Women in the settlements were encouraged to set up savings groups, which served several important purposes. "The savings group meetings were a platform for community members to discuss and exchange ideas on how to achieve resilience, while the savings helped them become resilient to shocks," says Kaphala. For instance, the savings played an important role in cushioning residents from the adverse economic effects of COVID-19 pandemic. In addition to serving as an initial mobilization tool, the savings groups served as convenient and affordable community banks with zero transaction costs for residents who normally find it difficult to access banking services, because they cannot prove creditworthiness.[21]

Lack of employment, and resulting poverty, was identified as a key driver of climate vulnerability in most of the settlements. Strengthening livelihoods was therefore recognized as a key

Photo Credit: CCODE

LCC distributing food to people affected by floods in Kawale.

strategy to address the root causes of vulnerability. "We cannot talk about building climate resilience if people's livelihoods are frail," says Modester Kaphala, FRUP National Leader. Skills development opportunities such as tailoring and designing, shoe making, tie and dye, mushroom farming, and peanut butter production are provided for community members, with a focus on women. Climate resilience of livelihoods was emphasized, for example, through the creation a business cooperative

called Zamanja Network (Zamanja is a Chichewa term for "handwork") in Lilongwe. Similar cooperatives are being set up in other cities.

Lessons for LLA

The work of the Malawi Alliance seeks to build the resilience of residents of urban informal settlements through processes designed to ensure equity and inclusivity, in consonance with the eight LLA Principles.

Devolving Decision Making

Malawi's Local Government Act of 1998 aims to support democratic principles, accountability, transparency, and participation of the people in decision-making and development processes. It defines 'local government areas', each with:

- An Assembly, with one elected member from each ward within the local government area.
- Traditional authorities from the local government area as non-voting members.
- Members of Parliament from the constituencies that fall within the local government area, as non-voting members *ex officio.*
- Five non-voting members appointed by the elected members, to represent the interests of special interest groups as determined by the Assembly.

However, decentralization is yet to take root in practice.[22]

The Malawi Alliance provides a bottom-up solution to engage, inform, and support decision-making by vulnerable

communities, drawing on local knowledge from diverse groups while providing them with the additional information, capacity and technical support they need to shape and create inclusive and effective solutions. At the same time, government institutions are engaged in the process, government staff are provided training. Support to the capacity of community governance structures increased acceptance of community decisions, and a joint commitment to outcomes.

Addressing Structural Inequalities

The project adopted the Political Economy Analysis (PEA) approach to identify formal and informal issues that influence different levels of community engagement. PEA builds and integrates understanding of the broader political and economic context into the design of development programs through an iterative process of identifying the interests of key stakeholders.[23] The PEA analysis highlighted limited capacity among community leaders in certain areas to engage with vulnerable groups; and limited transparency in the decision-making process in issues that affect the marginalized. To address these limitations, the project facilitated three participatory leadership workshops in each settlement to sensitize leaders on the plight of vulnerable members of the community.

The PEA analysis also found that urban governance processes in Malawi tend to exclude women, the poor, and youth. Under CDfC, women and youth from settlements were mobilized to take on roles in implementation, and contribute to community mobilization, disaster mapping, data dissemination, planning,

and other processes. This proved to be empowering for women and youth, enhancing both confidence and ownership of the process.

A Rapid Needs Assessments conducted as part of the project revealed that women and youth were mostly impacted by poverty and inequality, often working in low-paying jobs characterized by manual labor and dangerous working conditions. The combination of lack of skills and inflexible working conditions, lack of access to productive resources and inadequate sharing of family responsibilities conspire to limit opportunities for this group. Skills training, startup loans for businesses, and business management training for these vulnerable groups were therefore prioritized.

Patient and Predictable Funding

The UDFs are recognized as a best practice for LLA, as they allow community determination of the use of funding. The Community Managed Funds, which were established to pool contributions from residents and partners, empowered communities to take control of their climate adaptation interventions, provided predictability in funding to some extent, and were easily accessible by the community.

The governance and management of these Community Managed Funds was based on a manual that also lays out procedures for their capitalization, and for managing and reporting expenses in ways that are transparent and accountable. While getting partner contributions for the Community Funds

has proven challenging, LCC set up a Ward Development Fund for informal settlements where Community Resilience Frameworks or Risk Management Frameworks had been completed. This is not only a recognition of the importance of these community plans, but also a good incentive for communities to participate in the planning process.

Investing in Local Capabilities

In addition to enhancing local capacity for participatory governance, monitoring and evaluation, and advocacy, the project trains community members, mostly youth, in the use of GPS devices to produce disaster risk maps. Communities are exposed to other technologies such as Kobo Toolbox.

Equipped with the skills and knowledge to generate data about their communities through profiling, enumeration and mapping for risk and service distribution, the communities were able to produce risk maps and maps on the location of basic services, and use them to deepen their discussions amongst themselves, and with government, on resilience.

Recognizing the multidimensional impacts of climate change and the urgency for collaborative approaches to address them, the project works closely with institutions like the LCC to use community generated data and plans to improve bylaws and the delivery of basic services.

For example, following the production or disaster maps, the residents of Kawale adopted community bylaws on proper waste management and invested in clearing drains in readiness for the

rainy season, to prevent flooding. In the Nancholi community in Blantyre, as well, community leaders continue to work with the local police and city council to manage waste disposal and drains.

The informal settlement of Mgona successfully lobbied for the construction of a bridge that connects the communities to the Kanengo industrial area, which provides them with livelihoods. "The training empowered us to look at the disaster risk assessment data as our own, to guide our planning and negotiate with the government and other authorities," says Chikondi Blackson, Chair of the Mgona Ward Development Committee. "This is how we have subsequently looked at any other data we collect for our settlement."

The project also supported communities in developing Risk Management Frameworks, with detailed analyses to trace the history and various manifestations of risks. The Frameworks resulted in a list of solutions identified by the community to include in Ward Level Adaptation Plans. As noted earlier, some councils like the LCC have since set up Ward Development Funds to finance community-identified priorities.

Building a Robust Understanding of Climate Risk and Uncertainty

The project has so far supported seven informal settlements in Malawi to develop Community Resilience and/ or Risk Management Frameworks, and to set up local committees to implement them. For instance, committees have been established for waste management; water and sanitation; floods response;

housing and infrastructure; and security. These committees include a minimum of 20 community members, 60% of them women.

Flexible Programming and Learning

The work of the Malawi Alliance used participatory monitoring and evaluation approaches such as peer monitoring, mentoring, learning, and co-production. Data collection tools were used during field visits, participatory appraisals, interviews, transect walks and scheduled progress review meetings with governance structures, interest groups and community members. This data was interrogated through bi-monthly, quarterly and bi-annual participatory outcome reflection meetings to stir debate.

Ensuring Transparency and Accountability

The project was developed using a bottom-up people centered approach, designed to facilitate community transformation led by the community members themselves. This implies a transfer of power from people, institutions and disciplines which have been dominant, to people, institutions and disciplines which have hitherto been subordinate.[24]

Under the project, the setting up of lower-level steering committees responsible for monitoring and evaluation of project outputs and outcomes ensured that a feedback mechanism to the community was inserted in the project design. This ensured active participation of community

members in financial matters related to the project.

Communities received support on how to participate in the formulation of council plans and budgets. However, communities have not yet been involved in monitoring and evaluation of council work, and therefore are unable to assess how public funds are being managed.

Collaborative Action and Investment

Collaboration and partnerships are key to the project. The engagement of the Ministry of Lands, Housing and Urban Development helped to popularize the National Urban Policy and the development of the National Slum Upgrading program, which provides a framework to guide government's long-term process of addressing challenges faced by people living in informal settlement. The Ministry of Forestry and Natural Resources coordinated monthly national cleanup activities in the informal settlements and spearheaded the promotion of the use of nature-based solutions.

Collaboration with the Department of Disaster Management Affairs (DoDMA), which coordinates the implementation of disaster prevention, mitigation, preparedness, response and recovery activities in informal settlements, has been key. Under decentralization reforms, DoDMA has officers in all the councils who work closely with communities. Academic institutions contributed to studio planning sessions, where communities were fully engaged. Various CSOs working in the informal

settlements have provided both policy and humanitarian support to communities. The Malawi Alliance considers partnerships with like-minded organizations important, as they add value by leveraging a pool of expertise and resources.[25]

Challenges and Lessons

Managing community expectations remains the biggest challenge in the process. The communities who participate in the assessments and planning expect the project to provide capital to implement activities, at least for the provision of basic services and infrastructure. The UPF has supported some implementation, but the funds it can provide are small compared to needs. The Malawi Alliance has, in response, intensified its resource mobilization efforts.

Meanwhile, the lack of accountability for public financing such as Parliament-linked constituency funding remains concerning.

In addition, conflicts between governance structures and processes, mainly relating to power struggles amongst "urban chiefs" (from traditional forms of governance) and counselors and block leaders have affected implementation of the project. Community level governance structures remain in a state of flux due to lack of strategic guidance on their constitution, roles, and functions. There were no elected local governments between 1994-2000, and 2005-2014, and the vacuum created by their absence provided an opportunity for urban chiefs to entrench themselves as the de facto

focal point for social, economic, and political organization in urban areas. The reintroduction of elected local governments in 2014 and attempts by the central government to end the role of urban chiefs created a leadership paralysis that makes it almost impossible for urban communities in most areas to meaningfully involve governments in collective action.[26]

Several lessons have been learned over the course of the project.

To build urban community resilience, it is important to recognize the interconnected nature of challenges and solutions. For example, the residents of informal settlements were disproportionately impacted by the COVID-19 pandemic. This added another layer of vulnerability to the same group that bears the brunt of the impacts of climate change.

There is a need to anticipate, rather than react, to limit the impacts of climate change. Communities must be supported in developing early warning systems that will help them anticipate disasters, and provided the support they need to prepare for them.

Resilience building requires capital investments to support the development of risk-reducing infrastructure, including resilient housing, drains and footbridges. Capital investments to allow disadvantaged communities to improve their conditions are critical.

There is a need to address the gendered face of climate change, which exacerbates existing inequalities. Vulnerable community groups like women and youth must be supported to acquire the skills and capacities needed to address vulnerabilities.

Success requires strong and clear community governance structures and processes, and accountability from government on the use of public funding, which must be directed to address community priorities.

There is a need to accelerate the adoption of technologies. Communities must be supported in adopting technology to avoid disruptions during disasters and pandemics, when physical meetings become impossible. Digital technologies are crucial for communications, transferring funds, collecting and generating data, and documenting and sharing knowledge.

Looking Ahead

The future is today. The ability to address today's problems results in the capacity to identify long-term solutions to decrease climate vulnerability. The work of the Malawi Alliance will continue to have an impact over time, with measures in place to ensure continuity long after the end of the project implementation period.

These measures include the development of community governance structures, and channels for sustained engagement due to the relationships built between communities and service providers. The informal settlements continue to use the risk maps and Risk Management Frameworks to act on issues such as waste management and poor drainage, including by engaging with community

members whose actions are perceived to compromise drainage systems; and to lobby for support from resource providers, as in the case of Mgona, Kawale, and Nancholi. The disaster profiles and maps support the formulation of community bylaws to guide local adaptation processes; and serve as early warning systems by highlighting areas of extreme vulnerability.

City councils and other resource providers continue to engage with the communities through community governance structures such as Town Hall meetings. The communities use their negotiating skills, obtained from capacity initiatives under the project, to engage with authority.

The seven communities have become learning centers for LLA, as the Alliance continues to explore innovative funding sources to support resilience building in as many informal settlements as possible, and to share their experiences to support other LLA projects.

Chapter 3
Climate Finance *When* it is Most Needed

Photo Credit: Friendship

KEY MESSAGES

- Households and individuals need access to secure and dependable funding in the immediate aftermath of climate disasters, to rebuild lives and re-establish livelihoods. Support from locally-based "transitional funds" during this stage can reduce long-term negative impacts on livelihoods, food security, health, education and overall climate vulnerability.

- Improvements in the capacity of households to earn and to save through climate resilient livelihoods helps to strengthen overall climate resilience. Savings can provide security, cushion families against disasters, and serve as seed money for more lucrative investments.

- Strengthening community collaboration within households, and between households and local governments, is also a form of capacity building for adaptation.

- Supporting individuals to understand and access basic rights and support systems, including social safety net programs, microfinance, and banking systems, is an important part of building social capital required for adaptation.

Devolved decision making

Addressing structural inequalities

Patient, predictable, accessible funding

Investing in local capacities

Building understanding

Monitoring, evaluation, and learning

Transparency and accountability

Collaborative action

The residents of Bangladesh's chars are among the most vulnerable to the impacts of climate change. Narrow sandbars that form due to silting in the country's 700 rivers, some chars are isolated islands surrounded by water, while others cling to the shore.[27] Chars typically last for around two to three years and are highly vulnerable to climate-related disasters such as storms, cyclones, floods, and erosion.[28]

Despite their temporary nature and exposure to climate-related disasters, 109 chars scattered in 32 of the 64 districts in Bangladesh are home to about 10 million of the poorest people in the country.[29] They are deprived of basic services due to their isolation, and eke out a precarious living from low-yield agriculture.[30] Even this is lost when the chars are flooded or eroded. The resulting loss of livelihoods and income causes food insecurity and malnutrition; increased borrowing at high interest rates; psychological stress, anxiety, depression, dizziness, insomnia, and post-traumatic stress disorder; and reduced ability to spend on health and education.[31]

Char residents are particularly vulnerable in the immediate aftermath of a disaster. As documented in other parts of the world, unless disaster-affected people receive immediate support, impacts resound for decades. Affected individuals are forced into distress sales of assets, if they possess any. An entire generation may be denied food, education or health benefits, with knock-on impacts for future generations.

In 2014, Friendship, a non-governmental organization in Bangladesh, initiated an Community Initiated Disaster Risk Reduction (CIDRR) approach. Friendship Disaster Management Committees (FDMCs) were established to provide training and capacity building to char residents on disaster preparedness, participatory risk assessments, and planning. Residents were supported in developing adaptation plans, with the broad objective of improving their overall economic outlook and resilience.[32]

However, a survey conducted after the project was completed found that residents were unable to implement the plans due to three main reasons:

- Lack of access to capital, to reestablish livelihoods.
- Lack of information on support systems and safety nets for the rural poor.
- Limited access to local governments, to seek support.

In response, Friendship launched a Transitional Fund to support this vulnerable population when they need it most, and to prevent long-term impacts of climate disasters.

Transitional Fund

The Transitional Fund was launched as a five-year project in 2019, with assistance from the Luxembourg Ministry of Cooperation. It was designed to provide small grants, technical assistance to improve livelihoods, and support to access, and advocate for, government services. Sixty char communities with more than 1800 families were supported in 2020 and 2021, across five districts.

In each community, the families most vulnerable to climate disasters were identified through consultations with residents. FDMCs were formed with representatives from 30 of the most vulnerable families, while ensuring that at least 60% of the members were women. These FDMCs served as the focal point for all activities. Following an assessment of needs, assets, skills, and potential for resilient livelihood options, small grants (typically around €58) were provided to kickstart the new livelihoods.

The focus then shifted to capacity building and technical support to enhance earnings, and to encourage micro-savings each week after families started earning. Due to the lack of banking facilities, funds were deposited into the project account and a record of the savings was kept on individual Family Income and Expenditure (FIE) cards retained by the beneficiaries.

Climate-Smart Agriculture

Families were trained in climate-smart agriculture, where flood and saline tolerant crops were introduced. Summer and winter vegetable seeds were provided, alongside instructions on growing them. Green technologies such as drip irrigation, sack gardening, organic fertilizer, and pheromone traps were also introduced. Members received training on record keeping, and assessing the profitability of crops at different times. With the traditional farming calendar disrupted by climate change, a new seasonal calendar was developed, with appropriate options for different climatic conditions.

As part of their training, residents were taught how to maximize crop production,

expand their businesses, and save for times of crisis. Groups within the FDMCs met every two weeks to discuss and learn about topics of common interest, such as integrated pest management, crop rotation, and seed bed preparation in farms or household gardens. Participants received updated information to enhance agricultural production, and training courses were conducted on issues such as appropriate cropping technology, and seed processing and storage.

Livestock Distribution and Training

In addition to vegetable seeds, all 1,800 families received livestock and training on livestock rearing. Each family's individual capability, interest, location, proximity to water, and homestead space dictated the choice of livestock, in addition to the ability of the animals to survive and adapt in existing conditions, and the availability of fodder in the location.

More than 900 families received one indigenous "*Muzaffarnagari*" sheep, while some ultra-poor families were given more than one. The small-bodied *Muzaffarnagari* sheep variety has small muzzles and a split upper lip, which allows it to graze where no other livestock can – on harvested or fallow lands, along roadsides and canals, and on aquatic weeds and submerged grass. Each sheep averages between 20-25 kilograms and is well adapted to hot and humid climates. Perhaps most importantly, the breed is capable of lambing twice a year, often giving birth to twins, resulting in a high growth business. The sheep also has a high demand in the market, primarily for its meat.

More than 300 families received Black Bengal Goats – a small and compact breed, with small horns and short legs. Although it produces little milk, the breed is very popular in Bangladesh because it needs little feed and becomes sexually mature earlier than other breeds, producing one to three kids twice a year. The breed is disease resistant, adapts to any environment easily, and produces high-quality meat and leather.

In some southern coastal areas where animal feed is scarce in winter, poultry farming was found more suitable. Seventeen communities in Patuakhali and Bagerhat district received the easy-to-rear 'Khaki Campbell' duck variety. This breed is a cross between the famous egg-laying Indian Runner and the Ruel Kagua, which provides good meat. The Khaki Campbell is the best of both, laying more eggs than a hen. More than 6,000 ducks and drakes were distributed among 510 families, accompanied by training in rearing them.

The ducks and livestock were vaccinated under a program run by the government's livestock department.

Resilience Strategies

Several other resilience strategies were supported by the Transitional Fund, including improved access to markets, support to access social welfare schemes by the government, and awareness raising on civil rights and responsibilities.

To facilitate access to markets and economic opportunities, families first engaged in a participatory poverty mapping process to map out barriers,

Photo Credit: Friendship

Bulu Bala's family received support for homestead gardening and rearing livestock, and for accessing an allowance for her autistic son.

identify broken roads, bridges and culverts, lack of facilities, water logging, and other elements that hindered their engagement with the market. They were then supported in their efforts to petition the local government and other stakeholders to address these issues.

Support was also provided to enhance access to government programs, including social protection programs for the poor, homeless, elderly, and disabled. Youth from the community were trained to become community medic aides, solar technicians, flood volunteers, and community governance aides, to act as liaison between communities and local government. Community governance aides assisted families on a range of issues, from livestock rearing and vegetable production to legal matters. They helped families register births and

acquire National Identity (NID) cards, for easier access to health care and other government services. They assisted people with filling out their FIE cards to track their earnings and expenditure, and were instrumental in building capacity.

To build awareness on civil rights and responsibilities, community members, including youth, received training on issues related to governance and civil and constitutional rights, including the Marriage Act, child rights, the Legal Aid Service Act, land, dowry, domestic violence, and general hygiene. The Upakul and Char Theatres performed plays to help effectively convey messages, and various sessions were held between the residents and local government representatives.

Friendship Civil Society Groups (FCSGs) were formed to address social issues more broadly within the community. Each FCSG included seven members from the FDMCs and eight members from the community, including community leaders, local Union Parishad members, teachers, the elderly, and religious leaders. The FCSGs facilitated discussions on difficult social issues such as domestic violence and dowry, and supported access to legal services.

Initial Impact

A survey conducted to measure impacts over the first two years of the project found that FDMC members had adopted climate-smart agricultural practices, modern farming technologies, and hybrid seed varieties; and could access benefits such as government support for irrigation,

fertilizers, and pesticides. Farmers participating in the project increased their knowledge on integrated crop techniques; learned how to use tools and technology better; became adept at using the crop calendar; and learned about saline or food tolerance crops. The total average income per family increased by 63.4%. Families had stable financial standing and enough credibility to apply for small loans. Many gradually built their own shops for fresh produce, earning around €4 per day.[33]

For instance, Asma Begum and Zahir Beg live with their two children in Kanthalpara, a small village 10 kilometers west of Patuakhali. Surviving solely on Zahir's meagre wages as a day laborer, the family often went hungry, with not enough money to put food on the table. Asma decided to become a member of the Friendship Disaster Management Committee in her village. Through the Transitional Fund, she received 12 ducks, and training on homestead gardening, livestock rearing and on how to manage finances and save.

Within a few days, the ducks laid eggs that Asma could sell in the community. Soon she was selling eggs every day, using some of the income to support her family and putting the rest into savings. In three months, she had saved the equivalent of approximately €101 – enough to buy 300 ducks. Her business grew, along with the number of ducks on the farm and the household income.

"I get more than 200 eggs every day," explains Asma. "Every three months, I sell ducks for €3.5-€4 each. I earn €627 every month and spend €404, making a profit of over €200."
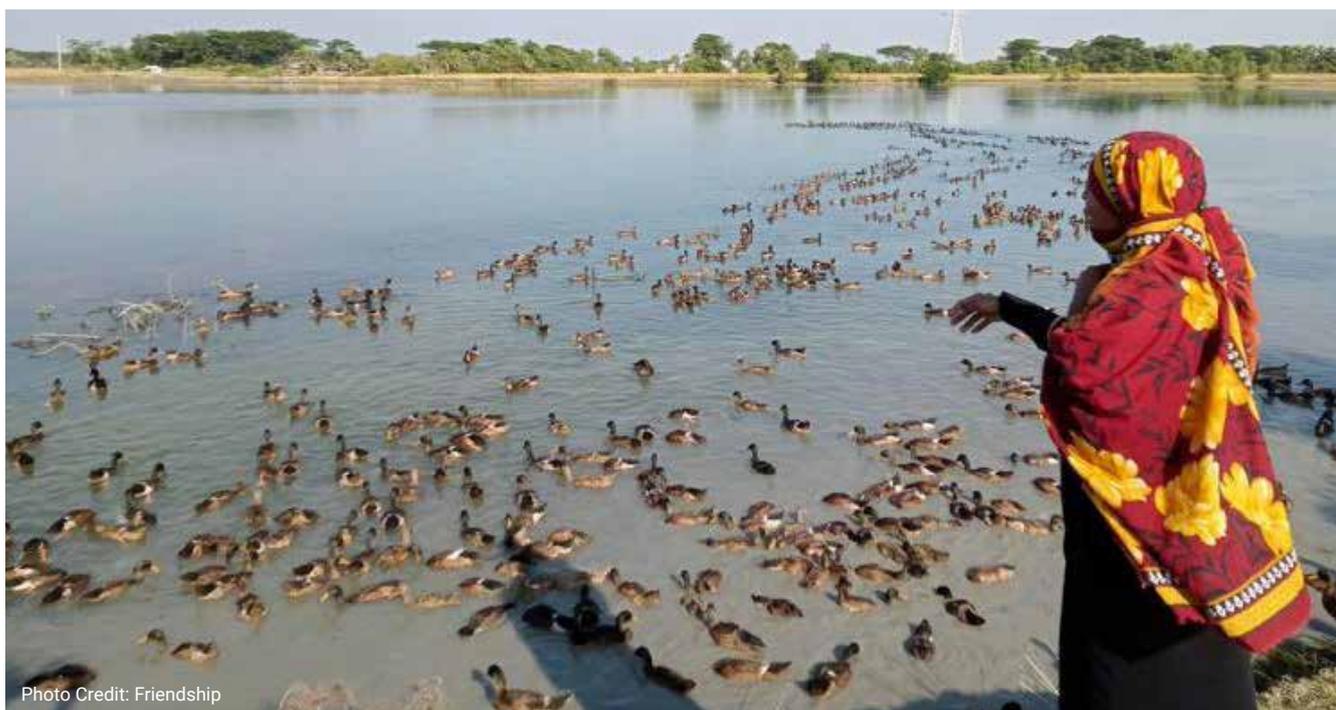
Photo Credit: Friendship

Asma Begum grows her business.

In addition to their duck rearing, Asma and her family have also benefited financially by cultivating vegetables in their courtyards and adjacent lands for food, and for sale at the local market.

The FDMCs were able to accumulate savings that could be used as initial capital for other investments. The savings provided people with a financial buffer to deal with uncertainties and increased individuals' confidence, security, and peace of mind. The savings also provided the seed money for higher-yielding investments in agricultural or livestock. The average savings per beneficiary was nearly €15. The FIE cards helped families monitor household finances, make decisions on what to cultivate and how; set future goals; determine where to invest money; and track and analyze the market situation.

All 1,800 households across the 60 communities became more aware of their rights and obligations, and an additional 6,387 beneficiaries gained access to government safety net program and/or grants. Of the 1,800 families, 1,298 registered for birth certificates and 127 registered marriages. In addition, 251 elderly people now receive €5 per month, 251 people receive a widow allowance of €5 per month, 100 people receive a disability allowance of €7 per month, seven freedom fighters receive €200 per month, and 1,292 children receive student stipends of €1 per month until class five. The total number of people covered by social protection programs increased from 1,235 family members to 6,387 family members within two years of attending awareness and advocacy programs.

Community members also have increased access to local government institutions, and have presented the findings of their poverty mapping to local administrations. As a result, 66 infrastructural/geographic

barriers are being addressed by the local government institutions. All beneficiaries and community members were supported to register for COVID-19 vaccinations and booster doses.

The FCSG meetings and orientations conducted in 2020 and 2021 have helped to build understanding of various social issues and helped create community cohesion by creating a space for sensitive discussions.

The activities under the Fund also helped to facilitate linkages in other ways. FDMC members received information on improving children's education and environmental responsibilities. Women members benefited from initiatives such as grants from the Department of Women Affairs to start businesses, and a nine-day course on making *Nokshi Katha* (a traditional Bengali embroidered quilt) and basic sewing training by Upazila Youth Development Offices.

Lessons for LLA

The Transitional Fund offers experience specifically in devolving decision-making; addressing structural inequalities; and providing patient and predictable funding that can be accessed more easily.

Devolved Decision Making

The capacity building and technical support provided to communities and households allowed them to make sound decisions on livelihoods, based on constant assessments and record keeping in the FIE cards. The poverty mapping helped them identify

barriers to markets, and work with local governments to address them, while participating in decisions relating to their livelihoods and resilience.

The FDMCs and FCSGs provided a space where residents could consult about their livelihoods, seek advice, find support and training, collaborate to share ideas, and improve their overall decision-making. While awareness raising on civil rights and responsibilities was not directly related to production, it supported people to make better choices, and to address social issues that sometimes compromise resilience.

Addressing Structural Inequalities

The project prioritized the climate vulnerable, particularly those impacted by climate disasters, who often face barriers in accessing services and resources. Recognizing that gender-based, economic, and political inequalities are root causes of vulnerability, the project specifically encouraged vulnerable and marginalized individuals to meaningfully participate in, and lead on, adaptation decisions.

In particular, the project worked to ensure that there were high levels of female participation in the awareness sessions and livelihood training. 60% of the FDMC members were women, ensuring their voice in decision-making and consultations. In addition, the project focused on providing information and awareness on legal and human rights, as well as government support services. A wide range of topics were covered, from women's empowerment, to governance, civil and constitutional rights, and legislation related to land, dowry,

domestic violence, and general hygiene, among other things. This awareness and understanding empowered people, enabling them to access services and receive support, and helping to break down structural inequalities.

Patient and Predictable Funding

The project focused on improving the ability of households to generate their own income. The initial grant to kickstart livelihoods allowed residents to develop more predictable income streams. The savings encouraged by the project not only helped to improve the financial situation of households, but also boosted their ability to cope in times of crisis.

Access to existing government services and social protection schemes was enhanced by ensuring that the residents had National Identity Cards.

Challenges and Lessons

The project helped char residents to understand climate risks, and enhanced individual and household resilience to the impact of disasters. The lessons learned, and challenges faced, are summarized below.

Engaging local community members in poverty mapping is an effective way of identifying local infrastructure priorities, such as the need for road and bridge repairs, culverts, etc. Establishing a good relationship between communities and local governments then helped getting these priorities addressed. Both are important ways of improving adaptive capacity.

The FIE cards helped families monitor their expenses and income, and to make better livelihood and spending decisions. The FIE card was also useful in helping families set future income goals.

The introduction of climate-smart agriculture and modern technology helped to boost incomes, and was readily adopted by other community members, leading to significant improvements in crop production. The use of hybrid seeds was effective, and training enabled people to develop their livelihood skills.

However, limited access to key agricultural inputs (including saline-tolerant vegetable seeds, land tenure, and land for grazing livestock) was a barrier. Saline-tolerant seed varieties were eventually procured by collaborating with agricultural research institutes.

Connecting people to existing government services enhanced adaptive capacity. Communities were able to access social protection programs, which was critical to building their resilience.

Ensuring that people have identification and legal documents, and a good understanding of social rights and obligations, is an important element of strengthening resilience.

Several challenges still remain – including a lack of water for domestic use and irrigation due to high levels of salinity; lack of access to communication, trade, and transportation infrastructure, and to markets; and lack of access to low interest loans or grants to deal with the impacts of disasters.

Chapter 4

Heat Stress, the Silent Killer in Indian Cities

Photo Credit: Moumita Shaw, IRADe

KEY MESSAGES

- Heat waves are a silent killer, particularly in Indian cities, where they are responsible for more deaths than any other natural disaster. Between 2010 and 2022, 10,104 deaths were attributed to heat waves in India.

- In cities in South Asia, where temperatures are already high and rising due to climate change, heat stress is exacerbated by the urban heat island effect.

- The poor are more exposed to heat stress because they live in informal housing made from heat-trapping raw materials, often without windows, and are typically exposed to more heat during their jobs in the informal sector. Heat Action Plans that target their needs are urgently needed.

- Lack of disaggregated data on mortality and morbidity due to heat stress, and heat stress thresholds for cities, constitute key barriers to understanding and planning for heat waves.

Devolved decision making

Addressing structural inequalities

Patient, predictable, accessible funding

Investing in local capacities

Building understanding

Monitoring, evaluation, and learning

Transparency and accountability

Collaborative action

Heat waves are a silent climate-related disaster. The impacts of the rising frequency and intensity of heat waves around the world are already being felt, with increased heat-related mortality rates, illness, work absenteeism, and loss or reduction in labour productivity. These impacts are heightened by a lack of awareness of the health risks related to extreme heat in the community, inadequate preparedness of governance systems to respond to heat-related threats, and lack of policies to improve preparedness.

Annual average temperatures in the South Asia region are projected to increase between 1.5°C and 3°C by 2050, relative to 1981-2010.[34] This, coupled with high poverty rates, makes the region particularly vulnerable to heat waves.

In India, summertime daily peak temperatures have already risen, and heat waves are more frequent, of longer duration, and more intense. They are projected to increase 30 times the current frequency, with a 92-200 fold rise in duration by 2100, if temperatures rise by 2°C.[35] The impacts are higher in Indian cities, where more than 438 million people live in slums, and where the urban heat island effect produces disastrous consequences.[36] While everyone can be negatively impacted by extreme heat, residents of urban informal settlements, street vendors, daily wage laborers, the elderly, chronically ill, children, and pregnant women are particularly at risk of heat-related mortality and illness.[37]

"Our shanty is a burning hell in the afternoons. The asbestos roof becomes so hot that you get blisters if you touch it," says the resident of an informal settlement. "It gets difficult to cook indoors, so I run outdoors every now and then to get some air. I fall ill frequently in summer, with fever and nausea because it is so hot at home. Last summer my husband had a heat stroke, and we fell upon very hard times because there was no income."

Figure 1: Heat-related mortality in India (2010-2022)
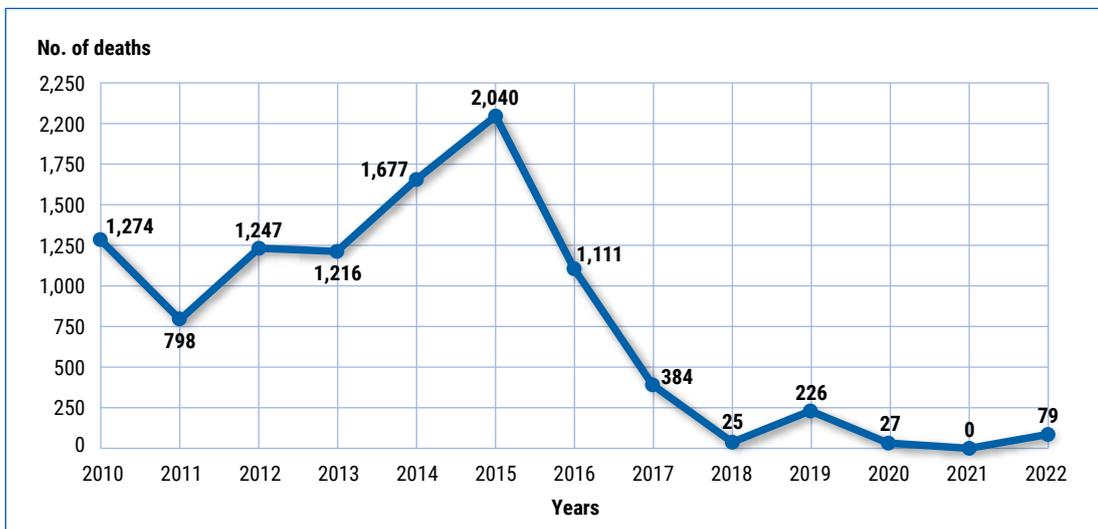
Source: NDMA and IMD

Figure 2: Heat wave days in India (2013-2022)

No. of heat wave days

Years
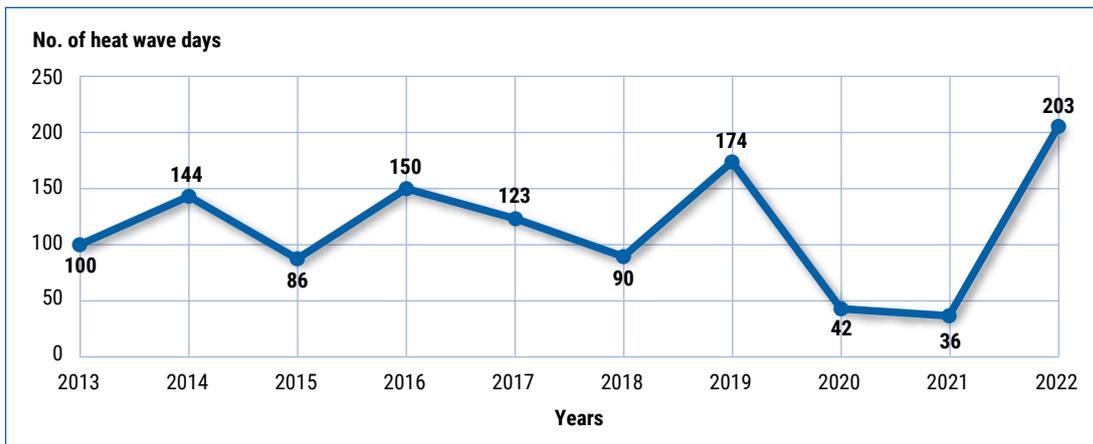
In 2010, for instance, the city of Ahmedabad in Gujarat suffered a devastating heat wave. As temperatures rose to 46.8°C (116°F) during a week in May, more than 1,000 deaths were attributed to the heat.[38] Preliminary analyses suggested that an excess all-cause mortality of at least 30% was associated with this event. This served as a wake-up call for the city authorities, to be better prepared to tackle heat waves. In 2013, Ahmedabad Municipal Corporation became the first city in South Asia to launch a Heat Action Plan.

In 2016, India's National Disaster Management Authority (NDMA) introduced the *Guidelines for the Preparation of Action Plan – Prevention and Management of Heat Wave*. This provided city governments guidelines for heat wave preparedness, management, mitigation measures, and inter-agency coordination.[39] Recognizing the growing threats from rising temperatures, cities across India adopted Heat Action Plans the same year. Under these plans, city municipal corporations collaborated with development partners to build awareness

of the health risks related to extreme heat; develop early warning systems to alert communities; and implement targeted interventions for vulnerable groups.

These measures helped to reduce heat-related mortality across Indian cities, despite the rise in heat waves.[40] In Ahmedabad, for instance, more than 1,100 heat related deaths have been prevented every summer since the implementation of the Heat Action Plan.[41] Mortality related to heat waves decreased in Telangana from 489 deaths in 2015 to 108 in 2017.[42] The number of deaths from heat-related illnesses fell sharply in Surat, from 2,040 in 2015 to a little over 200 in 2017, according to government data. The number of people known to have fallen ill because of extreme temperatures came down from almost 40,000 cases in 2017 to a little over 1,000 in 2018.[43]

While vulnerable groups were targeted in these plans, the interventions were generic and did not take into account spatial variations to address the needs of vulnerable groups. With city limits expanding rapidly, there is

an increasing number of slums and squatter settlements, spread across various locations. As temperatures grow extreme and cities reel under the urban heat island effect, temperatures differ in different pockets of the city. The areas where vulnerable groups live are typically pockets that are warmer than the rest of the city owing to the lack of trees and open spaces. To plan appropriate adaptation and mitigation measures, vulnerable groups need to be identified in the context of the areas where they live.

Focus on Vulnerable Populations

Rajkot is the fourth-largest city in the Indian state of Gujarat, with a population of 1.39 million.[44] Migrants are drawn to the city by its booming industry and service economy. The city's population, which has grown by almost 80% from 1991 to 2001 with a population density of 12,275 people per square kilometer, is projected to exceed 2.4 million by 2030.[45] Rajkot has grown by engulfing nearby villages and suburban areas. The fast growth in population has been accompanied by a rapid increase in informal settlements across the city, which grew from 118 in 2012 to 145 in 2017.[46]

The frequency of heat waves in Rajkot increased substantially in 2001-2010, compared to earlier decades.[47] Heat wave days and severe heat days have risen gradually from two to 13 days during the summer months of March to June. During the 2001 to 2021 period, heat waves have occurred almost every year, compared to an intermittent incidence of heat waves of relatively shorter durations in previous decades. The decadal cumulative frequency of heat wave days has increased from six days in 1970-1980, to 22 days in 1990-2000; 39 days in 2001-2010; and 66 days in 2011-2021.[48]

Figure 3: Informal settlements in Rajkot (2010-2015 & 2016-2018)
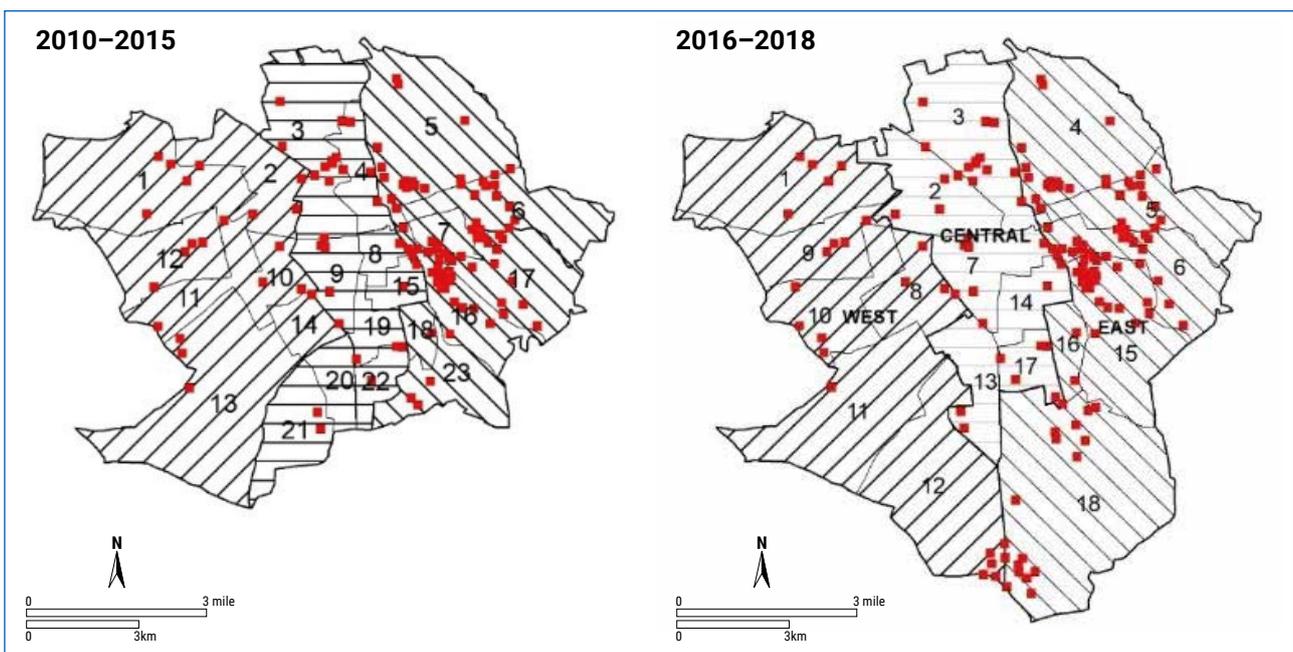
Source: IRADe

In 2017, an action research project was initiated by Integrated Research and Action for Development (IRADe), a thinktank based in Delhi, India. Supported by the International Development Research Centre, Canada, the project worked with Urban Local Bodies (ULBs) and local communities to formulate a first-of-its-kind, spatially differentiated (municipality ward level), gender-sensitive climate adaptive Heat Action Plan for Rajkot city.

Figure 4: Heat wave days in Rajkot (2001-2021)
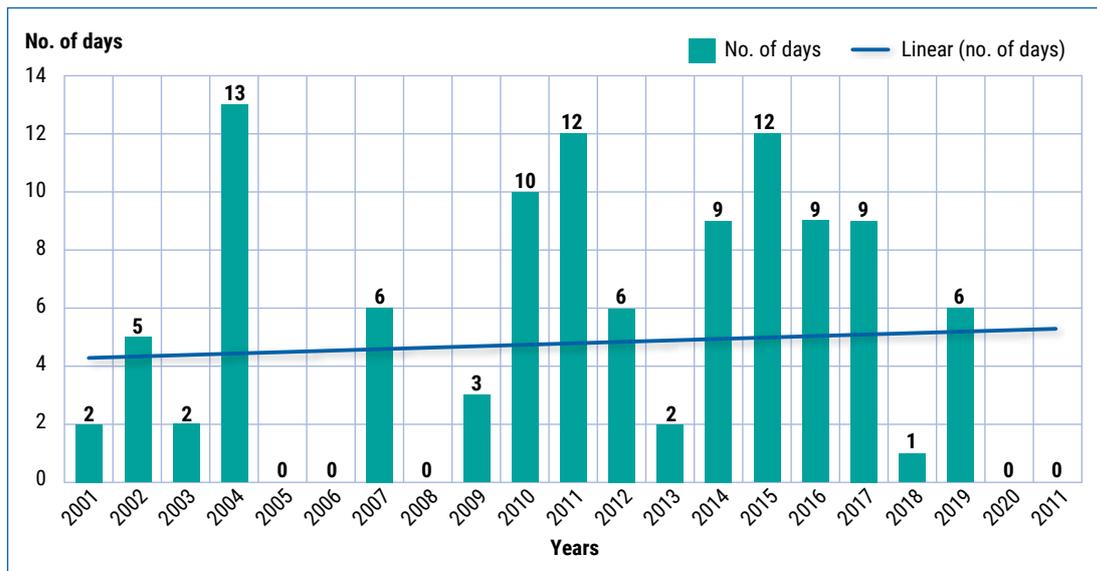
Source: India Meteorological Department (IMD)

Figure 5: Co-relation between heat wave days and mortality rate in Rajkot (2007- 2017)
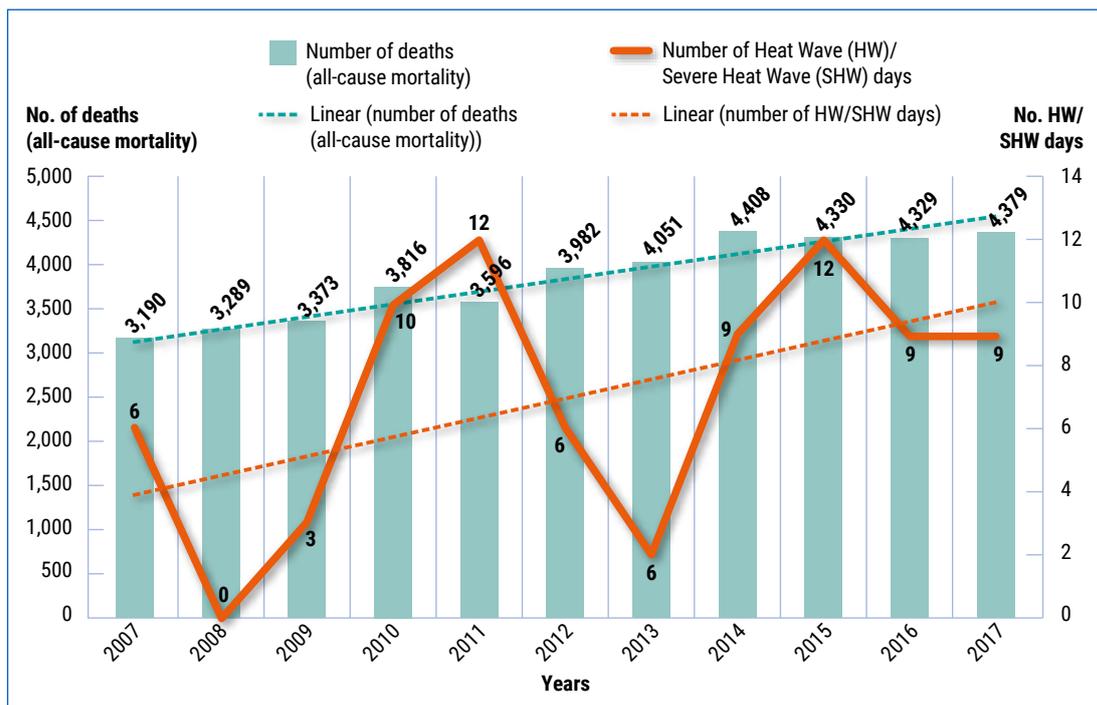
Source: IMD & Rajkot Municipal Corporation

In the first phase of a project, a comprehensive climate profiling of the city was conducted to identify the most vulnerable municipality wards in Rajkot, while considering the socioeconomic status and nature of work of the people living in heat hotspots.

In a second phase, a framework to implement, coordinate and evaluate a response to extreme heat was developed. It clearly demarcated the role and responsibilities of each government agency, including the ward level administrative unit of the city municipality, or the urban local body. It spelt out the role of other stakeholders like community-based organizations, NGOs, and the community in preparing, mitigating and managing heat stress.

Climate Profiling

Rajkot has a semi-arid climate with hot, dry heat for four months in summer, from March to June. An analysis of maximum temperatures (Tmax), minimum temperatures (Tmin), and relative humidity over 122 days during March-June for the 2001-2017 period was carried out to determine trends, and compared to the city's long-term climatological mean (1905-2000) for corresponding months to determine the deviation.

The average increase in temperature (Tmax) over 17 years was found to be 1.095°C, while the increase in the Tmin value was 1.43°C, with the maximum deviation in seasonal Tmin values observed in March (1.7°C). The average deviation of relative humidity in the morning and evening for the summer season was not significant, at -0.23% and -0.17% respectively.[49]

The analysis clearly showed a significant increase in the city's temperature, and a moderate decline in humidity levels, indicating that the weather has become warmer and drier over the years.[50] A sharp temperature increase in the month of March suggested that summer is arriving earlier, and Rajkot is experiencing relatively more heat in March. In addition to the increase in number of heat wave events, Rajkot is clearly experiencing an early arrival of hot days. This indicated that preparations for heat waves should begin in March, which was usually considered the transition month between winter and summer. Without a chance to acclimatize, the sharp rise in temperature and lower relative humidity in March could result in an increase in human morbidity and mortality.

Mapping Hotspots

IRADe worked in collaboration with India Meteorological Department (IMD) and Rajkot Municipal Corporation (RMC) to assess the spatial distribution of heat stress at the ward level in Rajkot. It first mapped thermal hotspots through remote sensing using land surface temperature (LST) images procured from Landsat 8, an American earth observation satellite. The LST satellite data was validated by comparing it to ambient air temperatures recorded by the IMD station in Rajkot, and data received from 20 automatic weather stations (AWS) installed in the city by RMC. IRADe then superimposed these

Figure 6: Thermal hotspots and slums in Rajkot
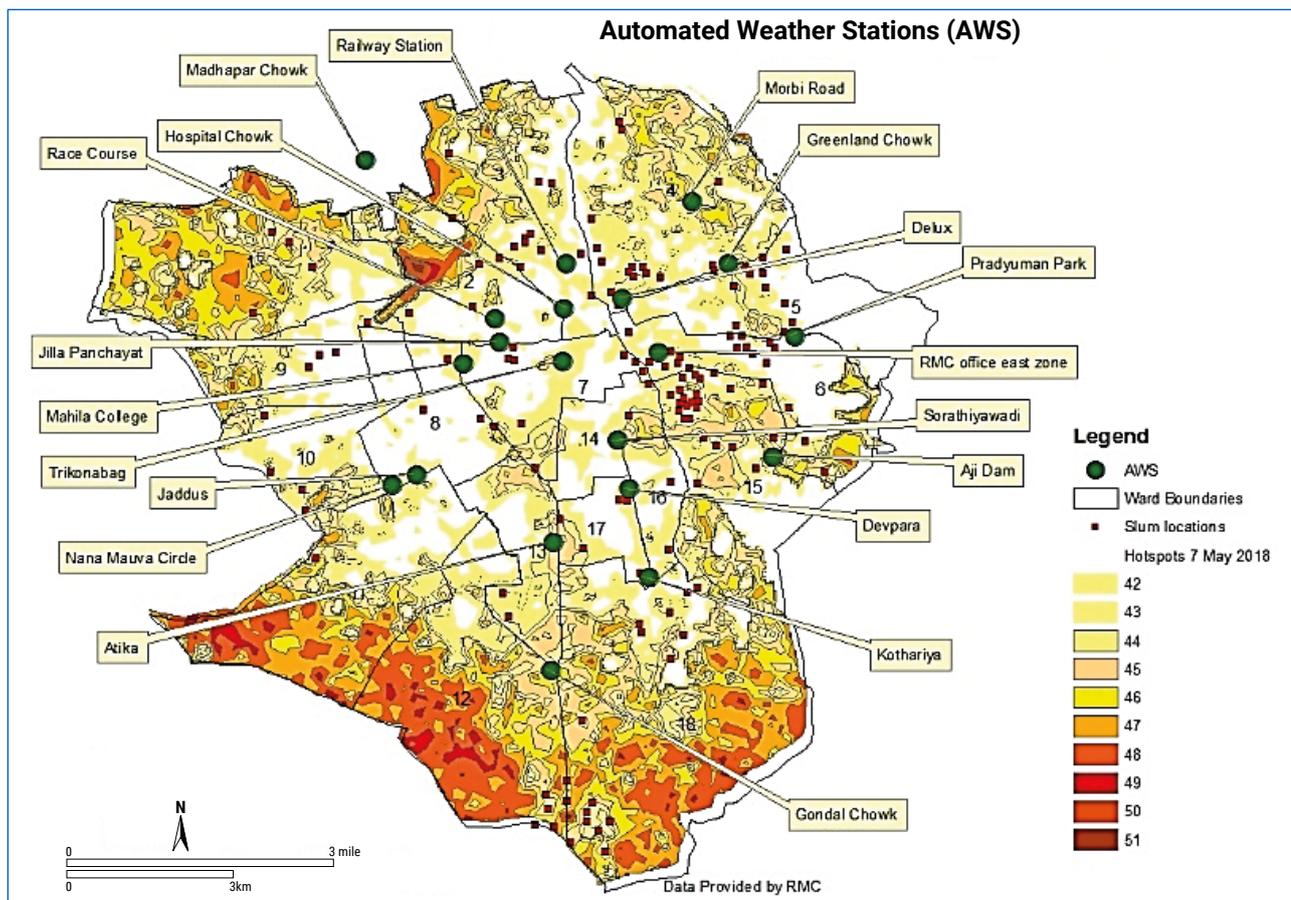
surface temperature maps on a map showing ward-boundaries and informal settlements to identify nine "hotspot" wards with surface temperatures recordings above 42°C in May and June of 2017 and 2018.

Assessing Relative Vulnerability

The Intergovernmental Panel on Climate Change defines vulnerability to heat as a function of the degree of exposure to the heat hazard, sensitivity to changes in weather/climate (the degree to which a person or system will respond to a given change in climate, including beneficial and harmful effects), and

adaptive capacity (the degree to which adjustments in practices, processes, or structures can moderate or offset the potential for damage or take advantage of opportunities created by a given change in climate).[51] IRADe used this definition to assess vulnerability in the nine hotspot wards.

One primary and two socioeconomic surveys were conducted in each ward. The primary survey included 286 households. The two socioeconomic surveys, which included 282 and 202 households, were conducted 14 days apart. These two surveys served as a baseline and endline to calculate the impact of extreme heat on the health, livelihood, and productivity of vulnerable communities in Rajkot.

The surveyed households included construction workers, street vendors, domestic workers, and road sweepers. On average, each household had four members. Door-to-door surveys captured information on occupation, working hours, occupational patterns, mode of transportation, the impact of heat stress, and the coping capacity of households.

The survey used a comprehensive index of eight sectors and several sub-sectors to assess the nature and status of heat vulnerability of households (see Table 1).

The survey revealed that people working in informal sectors lose more than 25% of workdays in a year due to heat stress, which at the same time triggers illnesses.

Table 1: Index used to survey vulnerable households in Rajkot

SECTORS	SUB-SECTORS
Housing	Ownership Number of rooms Housing structure, and material used for floor, walls, roof Number of windows, and exterior wall color
Cooking	Type of fuel Cooking area
Sanitation	Access to toilet
Water	Water source Water supply (in liters)
Electricity	Electricity supply and frequency of outages during summer Electricity bill and electrical appliances used
Health	Mapping high heat period Time of heat discomfort Heat stress symptoms Access to health infrastructure Distance from nearest facility Age-wise symptoms Health insurance Source of health insurance Reasons for not using government health facilities Differential impact of heat on women and men
Awareness	Awareness of the term 'heat stress' Awareness of medical facilities treating heat stress Awareness of mitigation strategies adopted by city governments
Heat stress symptoms	Heat exhaustion, heat cramps

This means that while the strength to go out and earn is diminished, health-related expenditures rise. "I run my small business, selling handkerchiefs and face towels, from under this tree because there is no shade available elsewhere," one street vendor told the surveyors. "I wish the government would build sheds with electric fans. That would provide relief to us and fetch more customers."

People working indoors are more prone to heat stress than those who work outdoors in the informal sectors due to heat-trapping material used for flooring and roofing, poor ventilation, and the absence of windows.

Women, with additional responsibilities as homemakers and caregivers, are more vulnerable because of the additional heat generated by the firewood used for cooking, and because they often have to fetch water from public taps when the sun is directly overhead.[52] "We depend on private water tankers to manage water requirements for the household," said Ratna, the resident of an informal settlement in Okhla, Delhi during the survey.

Influencing Change

The survey generated data on the impact of extreme heat on citizen health and productivity. Based on its findings, RMC lowered the heat stress threshold for the city by half a degree, to prevent heat-related mortality.[53] A South Asian Heat Health Information Network (SAHHIN) was created to share work and experiences with related organizations and institutions.

The findings were presented to government and non-government stakeholders (including the medical community), and to communities, and used to develop a *Climate Adaptive Heat Action Plan* for Rajkot, with interventions targeted at vulnerable populations. A draft plan was presented and further vetted through multistakeholder workshops. The resulting Plan aimed to provide a framework for the city government to alert vulnerable populations at risk of heat-related illnesses, and to coordinate and implement mitigation measures.

City and state level public institutions were trained to update the Action Plan on a regular basis, while specialized training was organized by RMC for medical practitioners, public health professionals, and frontline health workers to improve the preparedness of public health delivery systems.

A module was developed was developed by IRADe and the Indian Institute of Public Health (IIPH), to train medical staff on how to manage heat-related illnesses. ULBs set up oral rehydration corners to improve access to rehydration salts, and erected more than 300 kiosks to distribute drinking water and buttermilk throughout peak summer. ULBs also established rapid response teams at government run Urban Health Centers.

The Heat Action plan was implemented by the RMC health department through high-impact awareness campaigns and local level action to manage heat stress. Awareness raising workshops were conducted for exposed populations including traffic police, hawkers, street vendors, construction workers, and

school children. Workshops and evidence-sharing sessions were organized for policy makers and influencers, to leverage their power to connect and motivate citizens to take collective actions on heat stress adaptation.

A communication strategy was developed, followed by campaigns and outreach programs to communicate the risks of heat stress and its impact on health, livelihoods, and productivity; and ways to mitigate them. Heat advisories were released in the local language (Gujarati) through press releases, radio, TV and online campaigns, LED displays, hoardings, posters, and pamphlets displayed in key locations. For instance, prescription slips of hospitals run by RMC displayed measures to prevent heat stress-related illnesses. Door-to-door campaigns took place to train families to cope with heat waves and encourage them to adopt prevention strategies.

City authorities institutionalized heatwave risk reduction and heat stress adaptive capacities by developing a framework for reporting heat related morbidity and mortality by primary health centers and hospitals. A training manual for medical professionals was developed in Gujarati, and extensive trainings were organized for health professionals.

Conclusions

Rajkot's Climate Adaptive Heat Action Plan has helped to highlight the specific socioeconomic vulnerabilities of the urban poor, while identifying immediate, medium- and long-term measures to manage heat waves. By producing evidence of rising temperatures in the city and of its differentiated impacts, the process prompted and enabled policy makers to design, develop, and implement further devolved ward-level heat action plans, that identify context-specific interventions for vulnerable wards within the city.

The process, conducted during the COVID-19 pandemic, faced its share of challenges. Data and information were difficult to obtain – either because of the pandemic, or because it did not exist. For instance, lack of data on mortality and morbidity due to heat stress made it difficult to calculate heat stress thresholds (the thresholds at which mortality rises significantly). It was also clear that low-income groups were becoming even more vulnerable to heat stress because of the socioeconomic impacts of the pandemic, including unemployment, reduced income, and lack of access to health facilities.

The need for cities to develop green-blue infrastructure to reduce the impact of heat stress was also clear; as was the need to build the capacity of city governments, medical staff, and health workers, to support heat stress plans. Continued awareness campaigns, particularly for women in the informal sectors, casual workers exposed to heat, and outdoor workers are necessary. Finally, similar planning, which targets the vulnerability of the poor, is urgently needed in other cities around the world where temperatures are already high, and are rising higher.

Chapter 5
Organizing for Climate Change

Photo Credit: iStock/MariusLtu

KEY MESSAGES

- Local cooperatives and alliances can strengthen local leadership in climate adaptation and the resilience of livelihoods based on farming and forests.

- Cooperatives increase negotiating power and access to markets, information, finances, and technical assistance. Members can collaborate among themselves, and with regional associations, sub-national governments, non-government organizations, academic institutions, and global networks, to build resilience to climate change.

- Cooperatives can promote climate resilience by fostering equitable benefit sharing, sustainable management of ecosystems and biodiversity, and food security.

- Collaborative partnerships, access to technologies, knowledge sharing, finance, and effective monitoring and evaluation – activities supported by cooperatives and alliances – are necessary to scale local climate action, along with political will at all levels.

Devolved decision making

Addressing structural inequalities

Patient, predictable, accessible funding

Investing in local capacities

Building understanding

Monitoring, evaluation, and learning

Transparency and accountability

Collaborative action

Smallholder farmers in developing countries are particularly vulnerable to both extreme and slow onset climate change impacts, because of their high exposure and low adaptive capacity. Research has also shown that smallholder farmers who are effectively organized can benefit from aggregated links to markets and services, and from speaking with a collective voice to advocate for their needs.[54]

The role of agricultural cooperatives in supporting smallholder farmers is widely recognized since their large-scale introduction in the 1970s and 1980s.[55] Agricultural cooperatives are member organizations owned and run by members, to facilitate access to, among other things, natural resources such as land and water; information, knowledge and extension services; markets, food, and productive assets like seeds and tools; and policy and decision-making.

Cooperatives help farmers solve collective problems. For instance, access to markets is a common challenges. To address it, cooperatives can help producers exercise economies of scale. More members together have more negotiating power, and can attract more traders and institutional buyers by pooling their produce.[56]

Beyond this, there is broad consensus that cooperatives support all dimensions of reducing poverty because of the way they operate – they identify economic opportunities for their members; empower the disadvantaged to defend their interests; provide security to the poor by converting individual risks into collective risks; and mediate access to assets that members need to earn a living.[57]

Agricultural cooperatives have an important role in protecting smallholder farmers from the threats of climate change, including changes in weather patterns, floods, droughts, and weather extreme events. They can support efforts to identify and adopt adaptation strategies and disaster and risk management actions, by informing their decisions on crop type or location, the adoption of new technologies and modernization, water management, migration, insurance, reform of pricing schemes, extension services, and livelihood diversification, among others.[58] They can also support the adoption of good practices for long-term climate resilience, such as nature-based solutions (NbS) and agroforestry.

This chapter highlights three stories that illustrate how agricultural cooperatives and producer associations help farmers deal with the impacts of climate change, through strategies such as improving their organizational skills, diversifying livelihoods, and implementing agroforestry, and NbS. From growing shade-grown coffee in Mexico, to seaweed farming in Tanzania, to shea kernel value chains in Ghana, each story describes the range of adaptation measures that have been adopted, and highlights the advantages of working through local cooperatives for future climate resilience. These insights can particularly useful when considering how to apply and design LLA responses.

Coffee Cooperatives

One of the world's last remaining cloud forests are found in the Chiapas mountains in south-eastern Mexico, near the border with Guatemala. Nurtured by the heaviest rainfalls reported in the country, these unique forests are home to endemic species such as the horned guan *and* quetzal, and have been declared a UNESCO Biosphere Reserve. Within and around the steep mountain slopes of the Biosphere Reserves of the Chiapas Sierra Madre, shade-grown coffee is the main livelihood.

Mexico is among the world's top coffee producers, with the Chiapas region serving as the country's most important coffee producing area.

There are large coffee estates in the lowlands, and smallholder farms owned by indigenous communities in the mountains. The areas surrounding the Biosphere Reserve also have coffee farms managed by smallholder families with collective tenure (*ejidos*), and private small scale ranches practicing subsistence agriculture. Many of the smallholders cultivate shade-grown coffee, planting a canopy of assorted shade trees in their coffee plantations. This agroforestry practice has proven to have multiple mitigation, adaptation and resilience benefits: it provides vital ecosystem services ranging from biodiversity habitats to water catchment, carbon sequestration and soil conservation, while also generating livelihoods.

Photo Credit: Thomas Brémond

The *Comon Yaj Noptic* ("we think together") Cooperative, based in the La Concordia region of the Chiapas, helped farmers overcome the coffee rust epidemic.

In previous years, however, erratic climate conditions have cut coffee production by half in the Chiapas. Production fell from 138,000 tons to 69,000 tons over two decades.[59] This is attributed mainly to changes in precipitation and temperature patterns, along with extreme weather events, that impacted soil fertility and resulted in disease and pest outbreaks.[60] Outbreaks of coffee rust in 2011 and 2012 in Central America and Mexico, for instance, were attributed to climate change, which enabled coffee rust, caused by the fungus *Hemileia vastatrix*, to affect new ecosystems and increase virulence.[61]

A coffee rust epidemic broke out in the Chiapas in 2013, devastating coffee production, severely damaging livelihoods, and increasing debt and social inequality. Some farmers adapted by shifting to other (non-shade grown) varieties of coffee, intensifying production methods, and increasing dependency on external agrochemical inputs. These coping mechanisms are potentially maladaptive in the long term, with negative impacts such as increased rural debt and damage to ecosystems.

Other farmers shielded themselves from the worst impacts of the epidemic through their affiliation to cooperatives, which provided emergency support and credit when the disease first hit, while strengthening the resilience of smallholders by diversifying livelihood sources. Cooperatives were also quick to build connections with national and international initiatives that allowed them to invest in soil preservation and sustainability, by adopting agroecological and integrated pest and disease management solutions.

Better Together

Over the years, smallholder coffee producers in the Chiapas (with an average of two hectares of land per family) have formed associations, each with 100-500 members. These associations have then come together to create a second level of cooperatives, with up to 1,000 producers.

In response to the coffee rust epidemic, these cooperatives were able to swim against the tide by resorting to alternative forms of pest and disease management such as pruning, opting for disease tolerant local varieties, and using microorganisms to enhance soil quality and plant nutrition so that coffee plants had better defenses against diseases.

They also benefited from the support provided by the cooperatives to access affordable loans and credit, including through community savings. These community savings usually help members tide over lean periods outside the harvest season, given that coffee producers rely on the profits earned during the annual harvest season for the entire year.

In addition, farmers benefited from the efforts of cooperatives to promote livelihood diversification, by developing new value chains related to ecotourism and honey production. Honey production builds on the indigenous practice of managing *Melipona* "stingless" bees, which are endemic to the region, and produce a nutrient-rich honey with a diversity of uses.

The cooperatives innovated to address the challenges of more vulnerable sections of society – working with youth groups on ecotourism; creating

women's organizations for women coffee producers, including for roasting and selling roasted coffee directly on the national market; and setting up a women's financial institute that provides loans at low interest rates for business incubation. Working groups within cooperatives on these new value chains are now legally established cooperatives in their own right, allied with the original cooperatives.

"The coffee rust could have caused more damage, or we would have been less capable to respond, if the cooperative focused only on coffee for survival," says a member of the *Comon Yaj Noptic Cooperative*, based in the Nuevo Paraiso, La Concordia region of the Chiapas (*Comon Yaj Noptic* means "we think together"). "We need to keep analyzing potential climate impacts and adapting, to have the capacity to react."

The cooperatives also offer technical extension services to producers to improve coffee yields and quality; and provide support to access basic services related to health, education, sanitation, electricity, and communication. Youth from the community are trained by experts in agroecological practices, to become trainers themselves. They build community nurseries and share strategies to improve prices. "It's not just about producing and selling coffee, it's ensuring through our work the satisfaction of our collective needs such as health, education, and environment that is what has always inspired our work," says a *Comon Yaj Noptic* member.

Signing up to sustainability certification (including organic, Fair Trade, and bird-

friendly certification) not only helped enhance coffee sales and profits while conserving flora and fauna, but also provided access to social premiums offered by some Fair Trade networks. These social premiums are funds kept aside for the community to use each year, at the discretion of the cooperative's general assembly. They can be assigned to housing credits (for instance, after the 2017 earthquakes and tropical storms in 2020), or to provide loans to members.

In addition to the implementation of good practices that support long-term climate resilience, advantages of the cooperatives therefore include:

- Capacity development for, and commitment to, best practices related to climate risk and impact management, quality control, project management, and administrative and financial management.
- Collaborative networks between local smallholders, regional associations, subnational governments, NGOs, and academia, that support resilience building strategies.
- Collaborations with responsible buyers, leading to new markets (for instance, for specialty coffee).
- Better access to government programs, new value chains and markets, and grants from foundations.
- Cross-sectoral collaboration, leading to innovations and new social organizations, demonstrating how collaborations build social resilience.
- Livelihood diversification, income stabilization, and access to low-cost credits.
- Better access to markets, information, and technical assistance, with improved negotiating power.

- Adherence to social equity and human rights considerations, including the prohibition of child labor, and just working conditions for seasonal migrant workers (often from neighboring Guatemala), to comply with Fair Trade and other international standards.

Zanzibar Seaweed Cluster Initiative

Seaweed is perhaps the single most important aquaculture sub-sector in Tanzania, particularly in Zanzibar where it employs nearly 26,000 people (of which almost 80% are women).[62] The seaweed industry is an important livelihood source at the micro level. At the macro level, it is the third biggest contributor to foreign earnings in Zanzibar, after tourism and cloves, bringing in about €2 million annually.[63]

Tanzania started commercial seaweed farming in 1989, with two species of seaweed: *Kappaphycus alvarezii* (commercially recognized as *cottonii*); and *Eucheuma denticulatum*, (commercially recognized as spinosum).[64] However, earnings from the seaweed industry have fluctuated significantly due to the monopsonic nature of the seaweed market, which is controlled by multinational companies, and because of climate change.[65]

The increase in sea surface temperature and disease outbreaks due to climate change affect seaweed production. Disease include the "ice-ice disease" and epiphyte infestations. (Ice-ice is caused when changes in salinity, ocean temperature, and light intensity cause

stress to seaweeds, making them produce a "moist organic substance" that attracts bacteria in the water and induces the characteristic "whitening" and hardening of the seaweed's tissues.)

The commonly farmed *cottonii* variety, for instance, began to die off in some parts of Zanzibar due to increased water temperatures, and the higher magnitude of ocean waves that wash away the seaweed.[66] Many farmers lost their livelihoods, or were forced to produce spinosum despite its low market value.

In 2006, a network of academics, government officials, and farmers came together to form the Zanzibar Seaweed Cluster Initiative (ZaSci). The main objective of ZaSci was two-fold: to develop innovative farming techniques to increase production; and to add value to farmed seaweed by promoting the production of quality seaweed products for national and international markets.[67] A leadership team brought together representatives from government, market and industry, academia, and local growers and their groups.

ZaSci introduced a new farming technique of using deep-water floating rafts to reduce the problem of *cottonii* die-off. Farmers were trained to construct floating rafts with thick nylon ropes to grow the seaweed, and provided essential gear, including boats. A higher value *kikarafuu* variety of seaweed was introduced in addition to *cottonii*. Efforts were also made to standardize the design of seaweed farms, to reduce the space between farms and face them in the same direction to increase production areas, and to reduce the breakage of seaweed

due to high winds. These new farming techniques led to higher production rates and sparked the interest of new growers to adopt these practices.

Farmers were trained in the production of seaweed soap, made from local ingredients including caustic soda, coconut oil, water, and seaweed; and of dessert-like treats made from seaweed, coconut milk, sugar, and peanuts. As these new products helped to improve incomes, growers increased their value-added products to include body creams, massage oils, seaweed powder, cakes, cookies, puddings, jam, and salads.

Training was also provided in keeping accurate records on the health of the seaweed, the impact on the environment, contribution to local economies, and the impact of improved production on developing the community.[68] The training helped ZaSci members to monitor and evaluate production on their seaweed farms, and equipped them with the skills to understand and adapt to their environment.

ZaSci continues to look for opportunities to improve productivity by introducing new seaweed species and improving farming methods. Discussions have taken place with government departments to explore the possibility of providing additional funding, and support with respect to prices, revenues, and land lease. New points of collaboration with other projects and institutions have been identified. Efforts to build skills and capacity also continue.

Advantages of working through the cluster include:

- Cross-sectoral collaboration between producers, academia, and government,

leading to an improved understanding of, and support for, the seaweed market.

- Improved production, due to improved production techniques and the introduction of new varieties that are more adapted to the changing climate.
- Livelihood diversification, particularly through value-addition.
- Identification of new markets, including for value-added products.
- Increased interest and appreciation for seaweed production from local growers.
- Capacity development for improved production and product development, as well as record keeping and production monitoring.
- Improved adaptation and resilience to changing climatic conditions.

Global Shea Alliance

From Senegal to Uganda, right across Africa, nearly two billion shea trees grow naturally and in managed "shea parklands" that cover 300-350 million hectares. They contribute 10-25% of household income in some villages,[69] and are an important source of dietary fat, especially since the fruits ripen at a time when there are few alternative food sources available. About ten kilograms of shea butter is consumed per person every year in the region.[70] The trees also act as carbon sinks, sucking in 1.5 million tons of carbon dioxide each year.

In recent decades, shea has become a booming globalized commodity. While shea butter has been a cooking staple in Africa for centuries, it is increasingly a major ingredient in lotions, moisturizers,

Photo Credit: iStock/africa924

Shea butter being produced by women in Burkina Faso for use in food, cosmetics, and drugs.

and balms. The beauty industry is a large driver behind the growth of the shea value chains, set to exceed €3.5 billion by 2028.[71] In Ghana, for instance, shea nuts were the fourth best performing agricultural export in 2018, with a value of over €14 million.[72]

The local shea industry is an important source of employment, income, and economic diversification for more than 16 million rural women in Africa.[73] This income is typically the only income women have full control over, and because shea is grown during periods when other crops produce less, this income is even more essential to contributing to food security.

Every year, however, an estimated 7,929,417 shea trees are lost across West Africa due to climate change, lack of fallows, commercial agriculture,

and tree removal. Rainfall distribution, increased severity and frequency of droughts, and soil degradation have threatened agricultural production and exports, provoking volatility in commodity prices. Climate change has become a "threat multiplier" to the shea value chain, interacting with non-climate factors that characterize the wider West African environment, economy, and society.[74] If this trend continues, a major disruption to the shea supply chain is anticipated by 2034.[75]

The Global Shea Alliance (GSA) was established in 2011. It is a non-profit industry association that, among other things, aims to improve the livelihoods of rural African women. It supports members to implement collaborative solutions to challenges, develop quality standards, share best practices, conduct research and advocacy, and open new

markets for shea products. GSA has 706 members from 35 countries, including women's cooperative groups, brands and retailers, suppliers, and NGOs.

The GSA formalizes shea gatherers into collectives, educates women's groups about their rights and strategies to improve their income, and provides training in business development and health and safety. It also improves their capacities to manage disaster and climate risks and impacts. This capacity building helps to build the collectives' bargaining power and improve their recognition within the value chain.

The GSA launched the Action for Shea Parklands initiative in 2011 in response to declining tree populations across West and East Africa. The "promote, plant, protect" initiative addresses long-term and specific factors behind decreasing tree populations, while encouraging producers to plant new trees as an immediate response. Over the next ten years, the initiative aims to grow ten million trees, protect four million hectares of parkland, sequester 882,000 tons of carbon, train 250,000 people on sustainable parkland management, support research, and engage 500,000 women.[76]

Advantages of working through the GSA include:
- Formalization of women's groups into collectives, giving them stronger bargaining power and representation in the shea value chain, leading to improved incomes.
- Opening up new markets for shea products, including through new partners and international companies.

- Advancement on developing industry-recognized standards.
- Capacity and skills development for over 200,000 women, resulting in better quality control and aggregation techniques, and to improved incomes.
- Strengthened commitment to fair business practices.
- Promotion of laws and policies that focus on empowering the base of the value chain.
- Improvement in local infrastructure, including road networks and warehouse facilities.
- Increased tree-planting activities and protection of the carbon sink, contributing to climate resilience with adaptation and mitigation co-benefits.

Conclusion

Smallholder farmers are some of the most vulnerable to climate change and other shocks and stresses. Cooperatives, and alliances can play an important role in facilitating LLA by enhancing social capital, empowering smallholders, and creating risk-sharing mechanisms. They can help to create collaborations between national, regional and international stakeholders. Working through cooperatives and alliances can also help to increase and improve production, and diversify livelihoods.

Cooperatives and alliances can therefore support LLA Principles related to the devolution of decision making; addressing of structural inequalities, provision of flexible finance; investments in local capacities; building understanding of climate risks and uncertainties; and most of all, in collaborative action.

Chapter 6
The Educational Partnerships for Innovation in Communities Model

Photo Credit: The Sage Project at San Diego State University

KEY MESSAGES

- Large-scale city-university partnerships provide added human capacity to identify, understand, analyze and mobilize around local climate adaptation measures while engaging diverse community stakeholders and developing local, sustained expertise.

- The Educational Partnerships for Innovation in Communities (EPIC) Model is an approach to implement such partnerships that are efficient, cost-effective and impactful as well as adoptable and adaptable globally.

- Transdisciplinary collaboration across sectors is critical to address climate change and ensure all sectors of society are engaged in the process.

- Engaging university classes on hands-on, real-world projects locally ensures equitable learning opportunities for students and equitable engagement of community members.

- Investment in students' critical-thinking and problem-solving skills is an investment in societal resilience.

Devolved decision making

Addressing structural inequalities

Patient, predictable, accessible funding

Investing in local capacities

Building understanding

Monitoring, evaluation, and learning

Transparency and accountability

Collaborative action

Society has critical needs and insufficient resources. Globally, communities must deal with impacts of climate change, socioeconomic inequities, health disparities and their intersection. Collaboration across disciplines and silos is essential to develop innovative, creative, context-sensitive solutions, especially when engaging multiple local stakeholders.[77] In higher education, such transdisciplinary collaboration should be infused and prioritized into the curriculum to bridge knowledge to practice and implement solutions.[78]

Every institution of higher education (IHE) must prepare students to address challenges of an unknown future, particularly regarding climate change.[79] Investment in students' critical-thinking and problem-solving skills is an investment in societal resilience. This can be achieved by providing high-impact educational experiences, such as volunteerism, service/community-based learning, international educational experiences, and research.[80]

While some IHEs require such experiences through coursework, this is not universal and often dependent on the prestige and resources of the IHE. With limited support from the IHE, under-represented students are often excluded and thus less likely to benefit from experiences that would equip them with skills and knowledge to become global citizens.[81] This barrier to equitable access to high-impact educational practices within and across IHEs can be overcome by infusing high-impact experiences directly into the curriculum.

The ability to afford applied, hands-on learning opportunities across disciplines and through standard, degree-based coursework can be achieved via implementation of large-scale city-university partnership models, such as the Educational Partnerships for Innovation in Communities (EPIC) model, which has been implemented

by universities worldwide.[82] This model is a transformative approach to prepare students for the workforce, advance scholarship for researchers and practitioners and make meaningful, impactful contributions to communities through engagement with, and empowerment of, local community members.[83]

How EPIC Works

An EPIC partnership may engage dozens of university instructors and hundreds of students from across disciplines in high-impact, real-world, community-based projects, leveraging the existing teaching responsibilities of instructors in collaboration with local governments and community organizations and their identified goals.

The EPIC model does not replace existing city-university partnerships; rather, it complements and builds on those relationships by engaging students through coursework rather than (only) through extra- or co-curricular opportunities. Participating students, and their instructors, are part of project-based courses on campus that already exist, are already part of the teaching loads of instructors and already part of the programs of study for students.

In the context of EPIC, "university" refers to any IHE, while "city" includes local government municipalities and other agencies, such as neighborhood planning associations, county/provincial governments, district councils, regional transit (or water or energy) agencies, school districts and even state or national agencies, provided there is local focus and engagement.

To set up the partnership, typically, a university coordinator and a point-person from the mayor's or city manager's office meet to brainstorm local project needs. Projects are identified and prioritized by the city and are part of existing plans, budgets, and city staff responsibilities. The university coordinator considers which existing university courses could support those initiatives, while sharing topic areas of other interested instructors' courses to determine if they resonate with municipal staff. This process typically includes input from multiple municipal staff members as well. A range of projects are developed, including:

- Items in existing work plans that may be too politically risky or too undefined for dedicated staff time but ideal for students to explore.
- New ideas, questions, or challenges that staff want help understanding and applying locally.
- A list of "stretch" ideas not currently in local work plans, but in need of students' analysis, design, or outreach.

Once this brainstorm process is complete, the university coordinator shares resulting project opportunities university-wide to identify which instructors are interested in engaging their classes. The coordinators on each side of the partnership discuss the projects and potential course involvement in an iterative manner to align a series of projects and courses, at which point they begin scoping out details (timelines, stakeholders, deliverables, etc.) for the partnership.

Ultimately, these partnerships often involve collaboration on numerous locally-identified projects by hundreds of students and their instructors, drawing from undergraduate and graduate courses from multiple disciplines. The EPIC model breaks down silos on both sides of the partnership by requiring collaboration across disciplines and departments. It works within city and university administrative structures, minimizing the need for added resources to support the partnership. Thus, the model matches existing resources and needs in a sustainable way that can be scaled up for maximum impact.

Five Elements of EPIC

Five "elements" of the EPIC model ensure that city-university partnerships are successful, impactful and beneficial to all (Table 1).

The first requires that the partnership *respect existing administrative structures and individual responsibilities and incentives on all sides*. This is achieved by basing the partnership on existing projects and priorities in the city and existing courses offered by the university.

The second element requires that the university *create a genuine partnership with local governments* (or other community organizations), by establishing

Table 1: The five elements of the EPIC model and alignment with LLA Principles

THE EPIC MODEL AND LLA

Elements of the EPIC Model	LLA Principles
Respect existing administrative structures and individual responsibilities and incentives on all sides	■ Flexible programming and learning ■ Ensuring transparency and accountability ■ Collaborative action and investment ■ Providing patient and predictable funding that can be accessed more easily
Create a genuine Partnership with local governments	■ Devolving decision making to the lowest appropriate level ■ Investing in local capabilities to leave an institutional legacy ■ Building a robust understanding of climate risk and uncertainty ■ Collaborative action and investment
Intentionally aim at improving quality of life	■ Addressing structural inequalities faced by women, youth, children, disabled and displaced people, Indigenous Peoples and marginalized ethnic groups
Focus on community-identified, -driven and -evaluated contribution to the community	■ Devolving decision making to the lowest appropriate level
Catalyze many disciplines and large numbers (courses, students, hours)	■ Investing in local capabilities to leave an institutional legacy ■ Flexible programming and learning ■ Collaborative action and investment

a formal agreement between and investment from both sides of the partnership. The city and the university dedicate time, funds, and knowledge to the partnership, with the intention of maintaining open lines of communication, building trust, and managing expectations.

The third element requires that the partnership *intentionally aim at improving quality of life* by prioritizing solutions rooted in sustainability, resilience, and progress, and identifying economic, community and environmental health

solutions in alignment with the UN Sustainable Development Goals (SDGs).

The fourth element requires that the partnership *focus on community-identified, community-driven and community-evaluated contribution to the community.* The university is not simply working *for* or *in* the community, it is working directly *with* the community to address local goals and challenges.

"When working with professional consultants, it's a very linear process where you expect to get something you

can turn around and build soon," says Jake Anderson, City Parks and Recreation Director, Monona, USA. "With an EPIC partnership, you think bigger about projects: what direction do you want to go in the future? What things are we missing? What are other people doing to address similar issues? It's been very helpful to spark discussions we wouldn't have had otherwise. The benefits keep paying off, even three or four years out."[84]

The fifth element of an EPIC partnership is that it should *catalyze many disciplines and large numbers of courses, students and hours* of effort, by engaging many students from many courses in many disciplines who work simultaneously on projects over the course of the partnership. Some EPIC programs begin with as few as one partner and two to three participating courses, then slowly build year to year. Others launch at a much larger scale, with dozens of courses, hundreds of students and thousands of hours of effort. Many of the longstanding programs average 25 to 30 projects in any given academic year.

As illustrated in Table 1, the EPIC model aligns well with the LLA Principles. The focus is on locally-defined projects, often explicitly identified in municipal workplans or policy goals and refined with participation of other formal (government, non-government) or informal (churches, neighborhood organizations) local stakeholders who understand local issues, needs, assets, and opportunities.

Engaging university students in the process of community-based work, by definition, expands community participation. There is more outreach

capacity due to the large numbers of students engaged, and students often garner trust among underrepresented groups more easily and quickly than traditional power structures. Students are often directly aligned through their studies in lifting voices and concerns of those who have been impacted by structural inequality, and they may be from the very communities that are historically underrepresented. The structural inequalities that range from trust issues, cultural and/or linguistic barriers and/ or historical neglect or oppression can be addressed by students who serve as politically-neutral third parties, and who may have greater success in effectively reaching underrepresented community members and ensuring their voices are heard.

While EPIC partnerships are not a source of project funding, the outputs of such partnerships can make it easier for local government or non-governmental agencies to access existing funding streams because the analysis, community involvement, visual renderings and project recommendations that emerge are often ready to be incorporated into more formal funding requests.

EPIC partnerships advance local capacity by bringing new knowledge, ideas, and energy to existing local stakeholder institutions. They train local university students in both hard (analysis) and soft (collaboration, public speaking) skills to be effective professionally. And they include critical, but informal, local actors that raise their knowledge and agency in ongoing capacity.

Most EPIC partnerships are focused exclusively or predominantly on climate uncertainty and how to understand risk, minimize existing risk, and plan for adaptation. This occurs from a variety of perspectives from hard science to economics to legal analysis to communication strategies to performing arts, to name just a few.

The entirety of the EPIC model is to make it easy for diverse disciplines to apply their perspective of the world to climate-based issues. This transdisciplinary approach yields innovative solutions to complex challenges, particularly climate change, through LLA.

EPIC partnerships develop through an iterative process between local stakeholders and a nearby university and projects only proceed when there is an agreed-upon scope of work, deliverables, expectations, and timelines for completion. The model is rooted in using existing academic courses, academic timelines and general output quality prior to any project moving forward, which helps for accountability and transparency regarding the work.

Finally, the EPIC model is rooted in promoting collaborative action and investment, and multi-stakeholder collaboration. The university and local municipality (usually) are the primary collaborative entities. Financially, each EPIC partnership is structured differently, though there is an expectation that the city contributes some funding to ensure a real investment in the partnership and the university contributes substantial in-kind money and time in the form of instructor salaries and the thousands of student

hours applied to the project. Third-party financial support, such as from an aid or philanthropic organization or higher level of government, often complements structural and fiscal collaboration.

Stories of Impact

How it Started

The "radically simple" idea for the EPIC model started at the University of Oregon, USA, in 2009 with the launch of the Sustainable City Year Program (SCYP).[85] It began following an informal conversation between two professors from different disciplines, who shared frustrations that the coursework from their students that contained real insights and opportunities for community influence were rarely shared beyond the class.

They approached a university alumna who was the city manager for a city over 100 miles from the university, and asked if the city would be interested in the type of work their students conducted in the areas of, for example, sustainable transportation, community engagement, sustainable building, enhanced civic spaces, and economic development.

To their surprise, the city manager responded that the city was desperately interested in the range of topics suggested and proposed a list of *additional* topics for which they needed creative solutions and analyses. Through an iterative process, they identified and scoped projects that worked within a typical university course and met the needs of city staff work plans, resulting in 19 courses across eight academic disciplines in the first year.

Several key insights emerged from SCYP's pilot year:

- Many university instructors are able and eager to connect their courses to applied needs.

- Instructors need a streamlined process to find a partner, scope the project and handle the logistics of site visits, staff/stakeholder engagement and community presentations.

- These efforts do not require university-level buy-in beyond that of the individual instructor who largely controls what happens in the course; instructors can opt in as they choose.

- The output of student work can be of immense, practical value for current and future-oriented municipal decisions.

- The scale of involvement combined with a limited time duration, for example an academic year, significantly increases the impact, energy, and value for the university and community.

- Having a coordinator on each side of the partnership is critical to ensure success. These coordinators do the work that makes it easier for others to participate, whether that is a participating university instructor or the engaged municipal staff-member. The coordinators must be paid for this work.

Currently, in a single year-long partnership, SCYP engages over 400 students from 20 or more courses from a dozen disciplines across the university, who collectively dedicate tens of thousands of hours of effort toward 15 or more local, high-priority projects identified by a local city partner.[86] Although the program is geographically based, the city partner need not be the same city in which the university resides; SCYP engages in partnerships with cities across the state of Oregon.

SCYP's instant success quickly received widespread recognition. *The Chronicle of Higher Education* described it as "*…one of higher education's most successful and comprehensive service learning programs*"[87] while *The New York Times* called it "*…perhaps the most comprehensive effort…to infuse sustainability into curricula and community outreach*".[88] Within two years of its launch, SCYP began training other IHEs and communities across the USA to implement the model in their own contexts.[89]

Replications of the model were implemented across the country at large, public research institutions such as University of Washington, University of Wisconsin, Texas A&M University and small, private institutions such as Augustana College, St. John's University and with large, urban cities, or small, rural communities such as San Diego, California (population 1.4 million), and Beacon, Iowa (population 445). The size of engagement and funding models for these partnerships varies according to the capacity and needs of the IHE and city partner – not only across the different programs, but also within a given program over time.

These successful replications illustrated that the model was flexible enough to be adopted and adapted to suit the size, budget, context, and priorities of diverse IHEs and their partner communities. As the number of replications of SCYP grew, an informal network of programs

began meeting annually to conduct training workshops, share best practices and get technical assistance from more seasoned programs. The group began calling itself the Educational Partnerships for Innovation in Communities Network (EPIC-N) in 2015.

EPIC-N began to draw interest from national and international agencies, including the US Environmental Protection Agency, the National Science Foundation, ICLEI - Local Governments for Sustainability, the UN Environment Programme, the Global Adaptation Network, START International and the International City-County Management Association. These partners saw value in replicating the EPIC model broadly, by expanding EPIC-N across the USA and globally.

Regional training workshops were conducted first throughout the USA, then internationally and new programs have continued to launch. With this growth, EPIC-N was registered as an organization

in 2017. It is now an international network of 66 programs in 19 countries (Figure 1). Each program operates autonomously and independently, provided that they follow the five elements described above.

Regional networks have already been established in sub-Saharan Africa (EPIC-Africa) and Southeast Asia (EPIC-Asia), and current efforts are underway to launch a regional network in Latin America and the Caribbean (EPIC-LAC).The establishment of these regional networks ensures that a train-the-trainer approach is implemented, such that the networks are informed and led by local community members and stakeholders.

EPIC-N's international expansion efforts have occurred through partnerships with the above-mentioned agencies, as well as Engaging Local Government Leaders, the Ministry of the Environment of Japan, the Inter-American Institute for Global Change Research, the UN Framework Convention on Climate Change, the American Geophysical

Figure 1: EPIC-N programs around the world
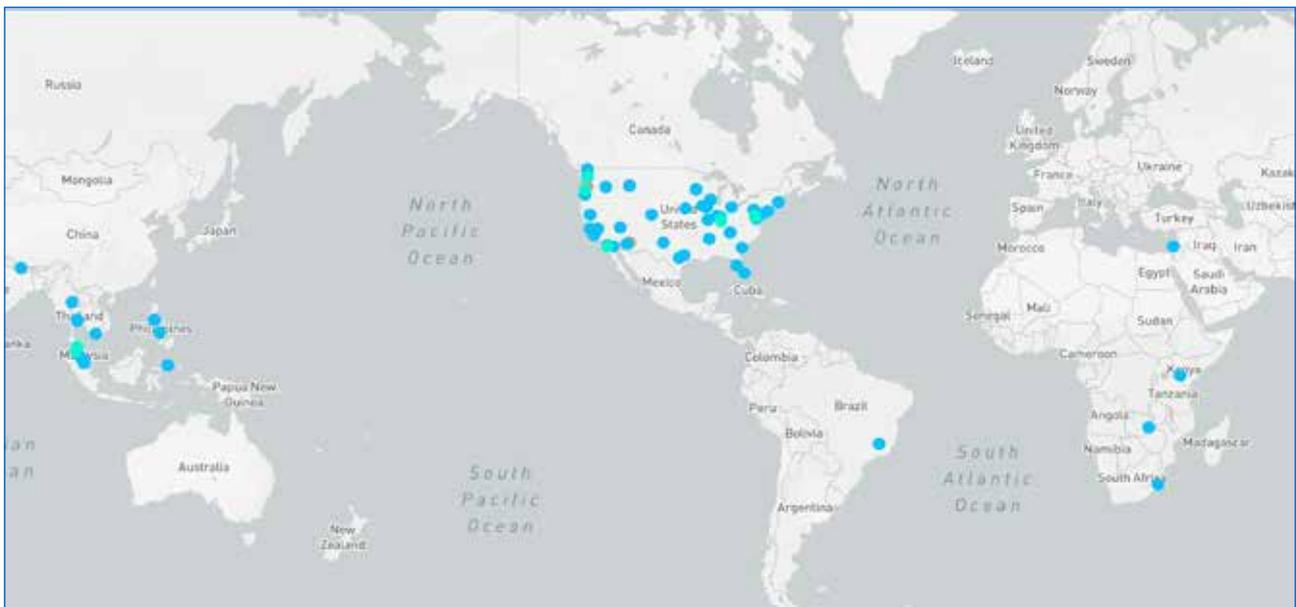
Union's Thriving Earth Exchange, Future Earth, Collaboratory, Second Nature and the Urban Futures and Policy Research Unit at Thammasat University.

Collectively, EPIC-N programs have tackled nearly 1,800 projects in partnership with municipalities and community organizations. The reports from these projects are featured in EPIC-N's Project Library and coded according to SDGs. These reports are public-facing documents that serve as a resource for municipalities and are part of the professional portfolios of students and their instructors.

EPIC-N and member programs prioritize SDGs in terms of the projects selected for collaboration and development of solutions, and many programs have projects focusing on climate adaptation, mitigation and resilience.

"The EPIC Network has stunning potential to help cities and communities adapt to climate change," says Lis Bernhardt, Coordinator of the Global Adaptation Network. "The current COVID-19 crisis could divert a lot of resources needed for adaptation, which makes programs like EPIC even more important as they use existing resources, thereby keeping resources free for other pressing challenges."[90]

The following sections present select case stories of LLA that have emerged from EPIC partnerships around the world. Each case story has specific outcomes, but it is important to note that the *scale of engagement* on multiple projects afforded by the EPIC model leads to broad outcomes as well. The breadth of

attention over a constrained time-period engages a wide range of formal and informal community leaders and staff-members in forward-looking, climate-grounded ways that otherwise may not happen. At the same time, students, the future local workforce, can apply and translate their new knowledge within a local political, social, and economic context and thus learn how to be effective conduits of knowledge to practice.

EPIC-USA

EPIC-USA programs have focused on numerous LLA projects, including sea level rise, floods, disaster mitigation and recovery, climate action planning, coral reef restoration, greening of parks and communities, mitigation of creek algae blooms, zero-waste initiatives, renewable energy solutions and active/public transportation campaigns, to name just a few. Climate adaptation, resilience and disaster response and recovery are common areas of focus for these programs, as described below.

Resilient Communities Project

The University of Minnesota's EPIC program, the Resilient Communities Project, launched in 2012. In 2014, the program partnered with the city of Rosemount to determine local impacts of climate change and propose strategies to reduce vulnerability to those impacts.[91]

In one year, the partnership focused on climate adaptation, stormwater management, neighborhood cohesion, community gathering spaces, asset-based community development, urban

agriculture, non-motorized transport, riverfront restoration, public planning processes, greenhouse gas emissions, invasive species management, recreational programming for youth in nature, low-carbon energy sourcing, water conservation and reuse, community cultural integration and recreational opportunities for under-served populations.

The project on climate adaptation identified community-specific climate risks for the first time, as well as a series of specific adaptation strategies related to transportation, infrastructure, natural resources, water quality, agriculture and food resources, public health, and community relations. For infrastructure, students provided specific recommendations to reduce the amount of pavement, replace culverts, use local

land use plans to shift building sites away from vulnerable areas and integrate energy efficiency into local infrastructure.[92]

For Rosemount, a small town of 25,000 people, these recommendations represented an essential collection of strategies and directions to understand their vulnerabilities and opportunities to adapt to climate change. Notably, these recommendations emerged from a *single class* during a single year of engagement that also included more than a dozen additional courses and projects with equally comprehensive and robust action items.

Texas Target Communities

Texas A&M University's Texas Target Communities program has been

Photo Credit: EPIC-N

Texas A&M students conduct a site visit in Rockport, USA.

providing technical assistance to small, low-capacity communities in the state of Texas since 1993. In 2014, the EPIC model was implemented as part of these local collaborations. The program was already working with local communities to address flooding and associated water pollution in communities most vulnerable to environmental injustices.[93]

When Hurricane Harvey hit the Texas coast in 2017, focus switched from disaster prevention to disaster recovery in Rockport, a city devastated by the high winds of the storm.[94] In collaboration with Texas Sea Grant, the university helped Rockport plan for recovery and future resilience against the next hurricane.

This entailed a long-term recovery plan that included housing, economics, transportation, land use and the flexibility needed for the city's growth over the next 20 to 30 years. An important component of this recovery plan was to establish a task force made up of community leaders and individuals from a variety of different backgrounds who did not traditionally participate in local decision-making. Thus, the partnership engaged local communities in the decision-making process, incorporated collaborative action and investment, invested in local capabilities and utilized flexible and accessible funding to identify solutions for long-term recovery.

EPIC-Africa

EPIC-Africa launched in sub-Saharan Africa in 2017. To date, 20 African city-university pairs have been trained on the EPIC model through regional training

workshops described previously. Much of the focus of EPIC-Africa programs has been on informal settlements, waste management, flooding, sanitation and street safety.[95]

Durban EPIC

The Durban EPIC program is a partnership between the city of Durban and the University of KwaZulu-Natal, South Africa, that began in 2017. The program is embedded within the city's Durban Research Action Partnership program under the Environmental Planning and Climate Protection Department, and it collaborates with the School of Built Environment and Development Studies and the School of Engineering at the university.

As part of eThekwini Municipality's Transformative Riverine Management

Photo Credit: ©UNEP/Marcus Nield

University students Mbali Mitshali (right) and Zinle Ndebele (left) assisted with development of the Disaster Risk Management Plan for Quarry Road West's informal settlements.

Programme, the EPIC program engaged university students to address chronic solid waste and flood issues within Quarry Road West's informal community settlement along the Palmiet River. Students worked with community leaders to identify ways to better manage waste and help restore ecosystems along the river. They mapped sources and types of solid waste and waste discharge, and locations of dwellings and flood-prone areas within the community. Students also developed a disaster management plan and early warning system to reduce the occurrence and impacts of floods in the area, the first of their kind for the city of Durban and the Palmiet community.

"We learned an important skill of stakeholder engagement and governance," says Ndumiso Mbuthuma, a student from the University of KwaZulu-Natal. "For some of us, it was our first time working with communities."[96]

Based on the students' proposed solutions, the city dedicated approximately €350,000 to implement an early warning system, restore natural vegetation along the banks of the river, and reduce and manage waste in the Palmiet community. A pilot waste management policy was implemented whereby community members organize collection and sorting of waste and the city schedules regular pick-ups.

"I come from a rural area in Howick, which has been hit by a lot of social and environmental concerns because the settlements are moving closer to the dam due to lack of space elsewhere," says Mbali Mitshali, a student in Built Environment and Development Studies.

"Maybe one day, I can transfer the knowledge I've gained in Quarry Road West to my own context back at home. This, for me, is a stepping stone to something bigger."[97]

The partnership with the Palmiet community demonstrated several applications of LLA Principles, including:
- Shifting power to local stakeholders while providing support to address the burden of adaptation.
- Catalyzing effective, equitable, and transparent adaptation.
- Building robust understanding of climate risk and uncertainty by helping to inform adaptation decisions through a combination of local, traditional, Indigenous, generational and scientific knowledge.
- Investing in local capabilities to leave an institutional legacy.
- Creating adaptation initiatives for the long term without being dependent on project-based donor funding.

The partnership utilized the capacity of university students and guided city staff and community leaders in the community engagement process.

Lusaka Urban Sustainability Programme

The University of Zambia's Lusaka Urban Sustainability Programme launched in 2017 in partnership with the city of Lusaka, Zambia. As part of their EPIC partnership, students focused on the Kanyama ward, Lusaka's largest informal settlement, to explore solutions for flood-

Photo Credit: Lusaka EPIC Programme

Community engagement on strategic spatial planning to address urban flooding in Kanyama settlement of Lusaka.

prone areas that were inundated with solid waste, litter, and sewage problems.

The city worked with students and community representatives to develop local area plans based on community needs. Students conducted risk mapping and assessment activities, and interviewed community members to fully understand the physical, social, and economic impacts of flooding in the area. They provided the city and community with a report that included a detailed map of risk types and severity, and created a strategic plan and implementation framework to improve waste management, water infrastructure and water security for Ward 10 of Kanyama. The city produced a documentary on the process as well as policy briefs on water security and flooding.

This partnership allowed for investing in, and building, local community capacity while addressing structural inequalities. Community members received training in planning, climate information, gender and social inclusion, solid waste management

and project planning. This ensured buy-in and agency from the community through engagement with students, which helped build a strong understanding of climate risk and uncertainty among the community members and ensured collaborative action and investment.

EPIC-Asia

EPIC-N's newest regional network, EPIC-Asia, launched in 2021, following regional training workshops in Bangkok, Thailand and virtually. EPIC-Asia partnerships have focused on zero waste and green city initiatives, smart farming, wet market waste management, water quality monitoring and flood management.

The Universiti Pendidikan Sultan Idris launched their EPIC program in 2021 within the University's Green Education Centre via ongoing collaborations with Seberang Perai City Council in the Malaysian State of Penang. For the EPIC collaboration, the University focused on the community's smart farming initiative.[98]

Groundbreaking ceremony for Universiti Pendidikan Sultan Idris Green Education Centre.

Agriculture is the dominant economic sector in Seberang Perai, yet farmers are challenged with low yields and periodic harvest. The goal of the partnership was to enable local farmers and youth to increase income through implementation of sustainable farming/polyculture and composting strategies to develop and/or establish community smart farms.

To date, 42 local farmers and youth, 14 students and six professors from the university, nine staff members from city council and three agronomy specialists have engaged in related workshops for this partnership.[99] University students combined what they learned in their classes with such techniques as aquaponics and composting, as well as the use of digital technologies, such as real-time water monitoring and automated irrigation systems.

The Urban Futures and Policy Research Unit at Thammasat University, Thailand,

launched their EPIC program in 2021 in partnership with Hat Yai Municipality to assist with their goal to become a green and resilient city.[100] University students created geographic information systems (GIS) layers to form an inventory of existing green spaces in the community so that the municipality could prioritize locations for additional green spaces.

EPIC-LAC

EPIC-N is in the process of establishing a regional network in Latin America and the Caribbean (EPIC-LAC), with initial virtual training workshops completed as of writing. However, EPIC partnerships have already begun in Latin America, with the first occurring in 2015 with San Diego State University's Sage Project.

Given the unique geographical location of the city of San Diego at the USA-Mexico international border, the Sage Project at

San Diego State University, launched in 2013, works with community partners across the binational region.[101] Their partnership with the city of Tijuana, Mexico, focused on redesigning parks in under-served areas of Tijuana, through community empowerment, workshops and presentations.[102] San Diego State University geography and graphic design students visited the park sites at Parque Ejido Matamoros and Parque de Residencial del Bosque, met with local community leaders and proposed new site plans, designs, drought-tolerant landscaping and wayfinding signage based on community input.[103] The collaboration also engaged students and faculty members from three other IHEs in Tijuana.

The Universidade Federal de Minas Gerais, Brazil, launched their COMpasso (Resilient Communities) Program in 2017 in partnership with the city of Belo Horizonte, Brazil, to develop adaptation solutions for vulnerable regions impacted by flooding, landslides, and rising temperatures. The EPIC partnership included a community engagement initiative with residents of informal settlements to develop climate action plans, promote urban agroforestry, create green corridors, and improve energy efficiency of public schools to meet or exceed current and future energy needs.[104]

For one project, COMpasso focused on climate vulnerability in the Conjunto Paulo VI community and conducted a geodesign workshop with school children, who gained an understanding about the site and residents' concerns regarding impacts of climate change, learned how to use GIS mapping tools to map

sites, proposed interventions, and then came to a consensus on high-priority solutions.[105] The school children's final recommendations included the removal of houses in areas most vulnerable to landslides, new housing, street paving, a leisure park, and perhaps not surprising, an ice cream parlor.

These examples from EPIC-N's regional networks are just a few of the nearly 1,800 projects completed through EPIC partnerships to date. As global crises become increasingly complex and intersectional, IHEs have a responsibility to take an active, collaborative, and innovative role in identifying transdisciplinary solutions for these and future crises. EPIC programs, by design, can dedicate hundreds of thousands of hours of collaborative effort, expertise, and creativity toward that responsibility *per year*. Moreover, EPIC programs have a unique vantage point that encourages better understanding of the available capacity of both IHEs and local governments and how best to match them, while enlisting the local capacity of community members and engaging them in decision-making processes.

An EPIC Future

EPIC-N aims to help IHEs around the world leverage and apply existing resources to catalyze environmental and social change in partnership with community stakeholders through LLA.

Other ways that EPIC-N supports development of new programs is through extensive sharing of best practices of and lessons learned by EPIC programs.

Through the network's Member Commons, free technical assistance is available directly from other existing programs and includes sample scopes of work, communication plans, presentation designs and more.

The advantages for leveraging existing university resources to catalyze LLA are great, and the process of introducing and supporting the EPIC model to new IHEs is relatively streamlined once an initial introduction is made.

Financial support can be a challenge for individual EPIC programs, though the cost of administering an individual program is small relative to the vast array of resources an EPIC program leverages. Funding models to support operational expenses of individual EPIC partnerships vary within and across programs. Some programs are funded solely by a fee paid by the city partner. Others are supported entirely by the university. Still others are supported entirely by grant funding.

Educational, governmental, and intergovernmental institutions around the world have begun to recognize the increasing importance of cross-sector collaboration and the value that large-scale city-university partnerships like the EPIC model provide.

IHEs play an important role in addressing the enormous challenges of our society, as active participants in identifying solutions and as stewards of the next generation of workforce who will address these current challenges, and others we cannot predict.[106]
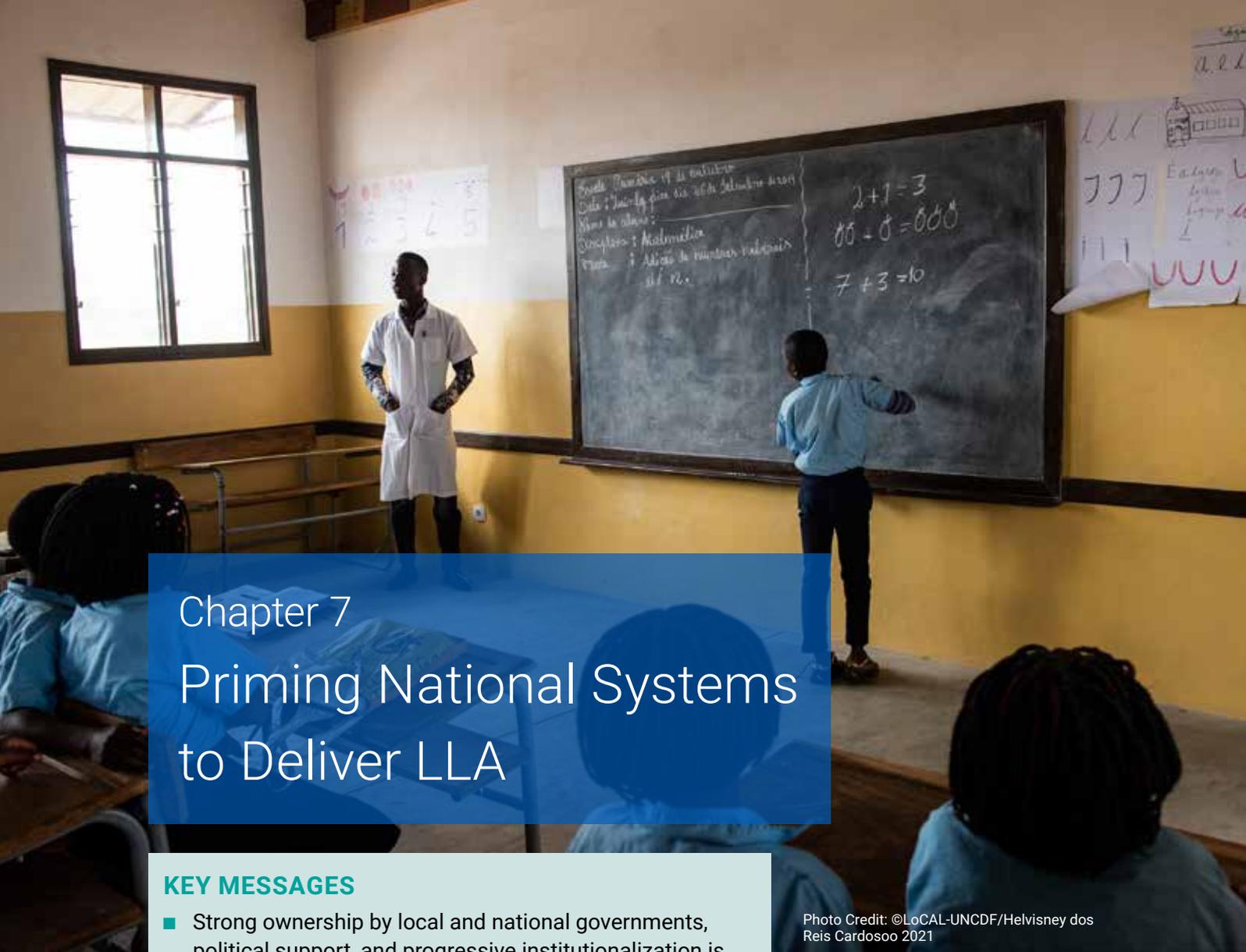
Chapter 7
Priming National Systems to Deliver LLA

KEY MESSAGES

- Strong ownership by local and national governments, political support, and progressive institutionalization is necessary for scaling up effective LLA.

- The Local Climate Adaptive Living (LoCAL) Facility provides performance-based climate resilience grants (PBCRGs) in the form of financial top-ups to existing local government budgets and resources to cover the additional costs of climate change adaptation.

- Local governments first receive capacity building and skills development support while they learn to implement the LoCAL approach. PBCRGs are then delivered through existing national fiscal transfer systems, providing an incentive for adaptation action.

- Common methodologies for monitoring and evaluation to assess progress across localities and countries can support efforts to assess progress on the Global Goal on Adaptation.

Devolved decision making

Addressing structural inequalities

Patient, predictable, accessible funding

Investing in local capacities

Building understanding

Monitoring, evaluation, and learning

Transparency and accountability

Collaborative action

Like many in his community, Hamidou Barry, a resident of Kudang Ward in the Central River Region South area of The Gambia, has been hit hard by climate change. Falling agricultural incomes caused by reduced access to water, periodic drought, and soil erosion has meant that he has been unable to save the money he needs to complete his education in electrical engineering.

He now looks forward with hope to the launch of a Cash for Work project in his ward, composed of 50 villages, by the Local Climate Adaptive Living (**LoCAL**) Facility.

The project will support the creation of vegetable and fruit gardens, principally bananas, irrigated by solar irrigation systems. Hamidou is among 50 community members (25 men and 25 women) who will create the gardens, receiving a competitive daily wage and the profits from selling the fruits and vegetables once the gardens are productive. "This process will ultimately

help me save money for school," said Hamidou. "It will also allow me to create a sustainable source of income because once the bananas grow properly, we as a community intend to sell them and export them to other regions."

The work in Kudang is being rolled out as part of a LoCAL Cash for Work program in 32 wards in The Gambia, in Central River Region North and Central River Region South. It is focused on Jobs, Skills and Finance for Women and Youth. The program aims to merge LLA to address the impacts of climate change with broader social needs, including job creation, skills development, and financial inclusivity, for a 'whole of society' approach to tackling the climate crisis.

The program is implemented through The Gambia's existing system for decentralized governance, which is distributed across the regional Local Area Councils; Ward Development Committees (WDCs) that are responsible for identifying needs and for planning and implementing local development initiatives; and Multi-Disciplinary Facilitation Teams, which aim to promote a collective approach to community development.

LoCAL's approach, of working through local authorities, is increasingly seen as key in building resilience to climate change at the local level. Local governments are in a unique position to identify local needs and are typically

Photo Credit: ©UNCDF-LoCAL Awa L Jagne 2022

Cash for Work Beneficiary Hamidou Barry Sinchu Alagie Kudang Ward, The Gambia.

mandated to undertake investments that reduce the vulnerability of the poor to climate and other shocks. These include investments in land use and agriculture, water management, irrigation and drainage, environmental and natural resources management, and disaster risk management. They also have the legitimacy and convening power to coordinate, co-finance and interact with stakeholders, including national level institutions, civil society bodies, the private sector and various local government departments.

However, they frequently lack the technical capacity and resources to fulfill this mandate, especially in a way that aligns with established decision-making processes and public planning and budgeting cycles. The LoCAL Facility, which works across 34 countries globally, is designed to help them overcome these challenges, while providing additional funding for adaptation and incentives to engage local stakeholders, in particular the climate vulnerable.

"The use of Local Area Councils and WDCs brings the government closer to the people and reduces the centralization of power in the central government," says Sheriffo Secka, Community Development Assistant, Kudang. "It allows planning, budgeting in consolidation with the community's local needs."

Sheriffo explains the decision to invest in a banana plantation and irrigated gardening system with a focus on banana-growing came about after consultations with community members. Each village selects one male and one female representative to put their

community's case to the WDC, which is chaired by an elected ward councilor. "Needs identified are ranked and the problem with the highest score in the rank is finally selected," he said.

Decision-making also factors in the findings of Climate Risk Vulnerability Assessments, which help prioritize activities that contribute to climate resilience-building. The process prioritizes decision making by the community, and the effective and inclusive participation of the local population, including vulnerable groups.

In The Gambia, the engagement and buy-in of national and local government systems and institutions is helping to ensure the future sustainability of the program once it concludes in October 2022. The Government of The Gambia is developing plans to continue to implement "LoCAL+" (the name may change), which will take on board lessons from the first phase, following its performance assessment carried out with engagement from local councils and WDCs.

Many Years in the Making

The LoCAL Facility, designed and hosted by the UN Capital Development Fund (UNCDF), was initiated in 2010 to bridge adaptation finance and capacity gaps. It aims to promote green and climate-resilient communities and local economies by establishing a standard, internationally recognized country-based mechanism to channel climate finance to local authorities for its effective use.

"We float over water like a hyacinth, constantly fighting for survival"

Photo Credit: ©UNCDF LoGIC 2022

"We are in a constant battle with and for water," says Nomita Roy, a resident of Kalabogi village in Khulna, Bangladesh. "During high tide, the roads to our houses are underwater. For drinking water we fill what we can during the monsoon season, but once the monsoon is over, we walk miles to ponds where the water is contaminated or too salty. We often fall sick after drinking it."

Even small changes in sea levels due to climate change has a big impact on the availability of water in south-west Bangladesh. The grants delivered through the LoCAL Facility empower hundreds of families to work with their local governments to identify solutions such as rainwater harvesting and waste storage systems for potable water. This supports women who otherwise spend a lot of time and walk long distances to provide water for their families and caring for sick members of the family.

In Bangladesh, LoCAL is implemented as the Local Government Initiative on Climate Change (LoGIC), led by the Local Government Division of the Ministry of Local Government Rural Development and Cooperatives. The four-year initiative is in its second phase, and is jointly implemented by the government, UN Development Programme, UN Capital Development Fund, the European Union and Swedish International Development Cooperation Agency. Local governments first receive capacity building and skills development support while they learn to implement the LoCAL approach. Grants are then delivered through existing national fiscal transfer systems, with future additional funds allocated on a performance-based criteria.

A key advantage of LoCAL is that it draws on national expertise and builds on national systems and procedures which already exist within a country. "LoCAL brings climate finance to the local government level so that communities can drive the climate adaption they need to make their village, district, or province resilient," says Ivete Maibaze, Minister of Land and Environment, Mozambique. "This local participatory approach is key: climate change impacts can be highly localized and needs vary from community to community. LoCAL is flexible enough to be able to take this into account."

The approach has been fine-tuned over time in 34 countries, of which 27 are Least Developed Countries (LDCs), seven are Small Island Developing States (SIDS), and 24 are in Africa. Over €125 million has been mobilized to date, demonstrating that systems are in place to deliver funds to the climate change frontline for locally-lead action. More than 300 local governments have been engaged and 12.5 million people benefited. Scaled nationally in its countries of operation, LoCAL has the potential to benefit over 600 million people.

Participating countries own and steer the future direction of the LoCAL Facility through the LoCAL Board, co-chaired by the Permanent Representative to the United Nations of the country that leads the LDC group at the UN headquarters in New York, the Chair of the LDC Group to the UNFCCC, and UNCDF's Director of Local Transformative Finance.

While international donors provide the bulk of the funds, an estimated 25% of committed resources come from the countries themselves – a reflection of the country-level support for the LoCAL approach. At its annual meeting in May 2022, the LoCAL Board agreed to build LoCAL into a US $500 million (around €500 million) mechanism by 2027.

LoCAL Approach

The LoCAL approach combines increased climate finance with capacity-building, technical support, and opportunities for South-South learning and exchange. LoCAL provides performance-based climate resilience grants (PBCRGs) in the form of financial top-ups to existing local government budgets and resources to cover the *additional* costs of climate change adaptation.

Design Phase

Once interested governments formally request UNCDF to launch LoCAL in their countries, a design phase is launched, while sources of finance are sought. National authorities, partners and local governments are engaged in this design phase, during which the necessary conditions for deploying the approach are defined (such as engagement with the community, and consideration of the findings of Climate Risk Vulnerability Assessments), and a country-specific PBCRG system is designed, with the engagement of key stakeholders for Phase I.

A menu of eligible investments is prepared by governments with support from the LoCAL Facility ensuring that identified activities are climate resilient. LoCAL is also aligned with national climate change and decentralization

strategies, supporting nationally determined contributions (NDCs) and national adaptation plans (NAPs), thus bringing the Paris Agreement and achievement of climate-related Sustainable Development Goals (SDGs) to the local and community levels.

Phase I

The first phase pilots LoCAL in two to four local governments, over one to two cycles of investments. International climate finance is channeled in the form of financial top-up grants to cover the additional costs of making existing development investments climate resilient through existing government fiscal transfer systems (rather than parallel or ad hoc structures). National ministries are involved in regulating the system. A performance-based system is followed, which typically involves these key steps:

1. Climate information and vulnerability and adaptation assessments are reviewed or undertaken to inform the process. Needs and capacities are assessed.

2. Local governments develop local adaptation plans or programs in a participatory manner, integrate adaptation in their own local development planning and budgeting processes, and cost and select adaptation measures to be financed through the grant.

3. Grants are disbursed to support implementation of LoCAL investments in the context of local authorities' annual planning and budgeting cycles, and selected measures are implemented.

4. Performance is appraised in terms of the degree to which additional resources have been used to build resilience and promote adaptation to climate change.

5. Audits are undertaken as part of the regular national process. The assessment results inform subsequent allocations, and the process provides an opportunity for capacity building.

This system of PBCRGs informs the relative size of the grants for the subsequent year, while also informing the
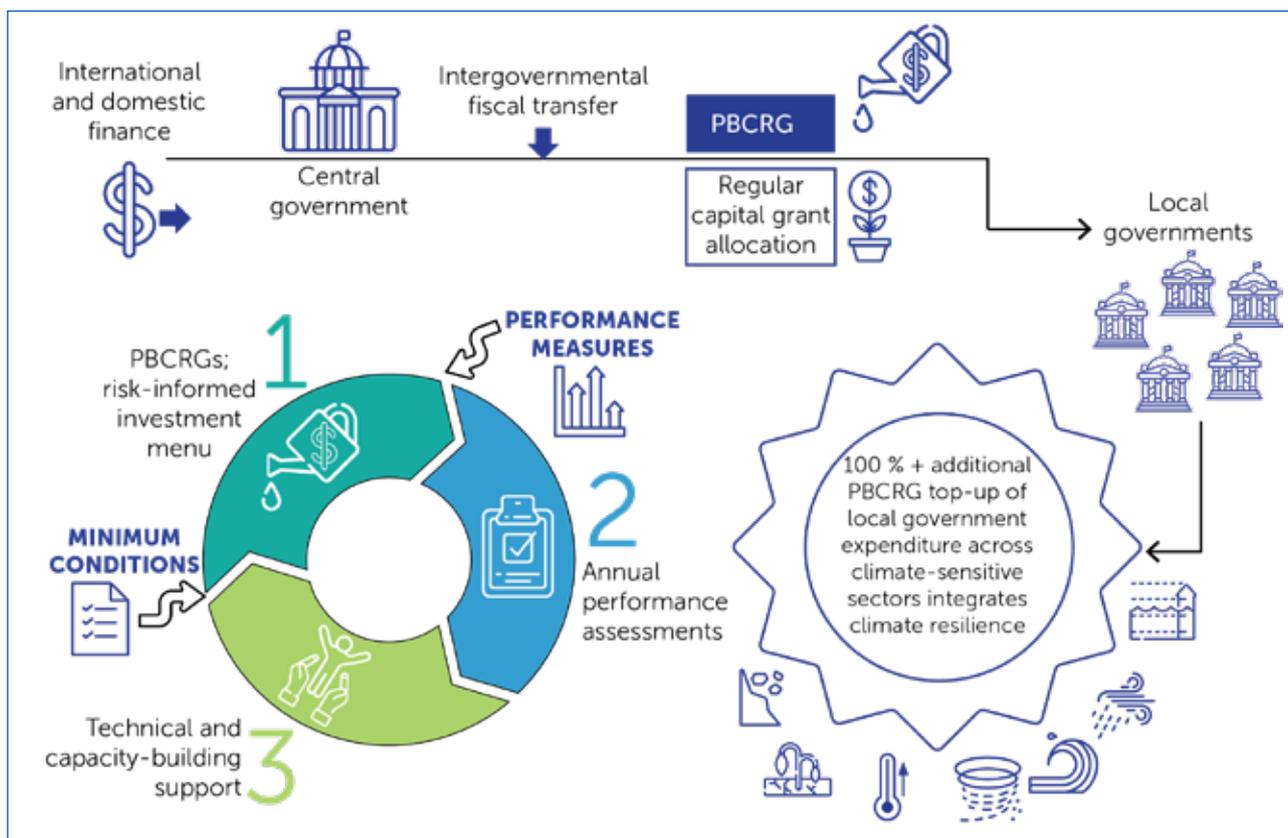
technical and capacity building support needed in future, creating a positive learning cycle. Incentives are therefore included for local governments to improve performance through annual performance assessments linked with access to, and size of, the grants.

Phase II

The second phase involves consolidating, expanding, and demonstrating LoCAL effectiveness at a larger scale, typically with at least five to ten local governments. Local governments and communities faced with different climate risks or socioeconomic or ecological vulnerabilities across various parts of a country are selected based on risks, capacities and possible synergies, amongst other criteria, to benefit from LoCAL.

Phase III

The third phase involves scaling up gradually for a nation-wide roll-out of LoCAL as the national system for channeling domestic and international climate finance to the local level. At this stage, the country leads the scale up and the LoCAL Facility offers specialized on-demand technical assistance as well as overall quality assurance in line with the standard.

Furthering the LLA Principles

LoCAL and UNCDF were among the first set of organizations to endorse the LLA Principles during the Climate Adaptation Summit in 2021, given the existing alignment of the LoCAL approach with the goal and spirit of the Principles.

Devolved Decision Making

The LoCAL Facility promotes devolved decision making by embedding adaptation into existing country systems, particularly decentralization processes and structures, ensuring decision-making power is *de facto* devolved to the local level. LoCAL equips local authorities and communities with the necessary tools to identify the climate change adaptation responses that best meet local needs. By scaling up the mechanism across and within LDCs, SIDS and African nations, LoCAL ensures that local stakeholders are increasingly empowered to exercise control and vigilance over how adaptation action is identified, planned, implemented, and monitored.

In Uganda, for example, LoCAL PBCRGs are aligned with existing local government grant structures developed as part of the Intergovernmental Fiscal Transfer reforms. The PBCRGs function as a climate window of Discretional Development Grants. Districts and communities can therefore program year-to-year the climate investments that best meet local risks and adaptation priorities. The dedicated window enables the implementation of cross-sectoral investments with climate adaptation additionality and the trace of funds, both critical elements for accessing (international) climate finance and UNFCCC financial mechanisms.

Likewise, in Benin, the PBCRG system is aligned with the country's Commune Development Fund (Fonds d'appui au développement) and in Ghana, with the District Assemblies Common Fund – Responsiveness Factor Grant. Communities and Municipal and Metropolitan District Assemblies therefore make decisions on the planning and execution of adaptation activities, with an incentive system in place to ensure the participation of communities and the most vulnerable. "LoCAL works because it gets to the people, and the people themselves participate in the work that they do to ensure that they support climate resilience in their community and enhance the capacity of local people," said Lamin Dibba, former Minister of the Environment, Climate Change and Natural Resources in The Gambia.

Participation of the Most Vulnerable

LoCAL promotes the participation of the most vulnerable sections of society by including incentives for participatory and gender-sensitive planning and budgeting, and encouraging the participation of vulnerable and marginalized individuals in adaptation decisions. The PBCRG system offers strong incentives for the active participation of vulnerable groups in local adaptation decision-making and implementation.

At the same time, additional capacity building is provided to the marginalized communities, to support their participation. In Ghana and The Gambia, for instance, job creation, skills building and livelihood diversification is prioritized, based on the high incidences of irregular migration of youths in search of work and opportunities. Local government authorities, at the ward level and regional level, work closely with youth, women and community representatives at the planning stage to ensure local context and needs are understood and met. Across

the process, priority is given to vulnerable groups including women, youth and returning migrants.

Predictable and Patient Funding

LoCAL is first and foremost a Facility to promote access to predictable and patient funding at the local level, supporting vulnerable countries to access climate finance from diverse sources of finance; employing government systems for predictability; and engaging with countries over a long period of time.

While the focus is on integration into existing national fiscal transfer mechanism, the lack or deficiency of such mechanisms is not a deterrent. In such cases, the development of such mechanisms, including human and institutional capacity, is supported so those systems can channel funds annually and in a predictable manner in the long run, to ensure sustainability of the approach.

The first LoCAL project in Bhutan, launched in 2011, remains in operation after over ten years. Following a pilot in three, then six *gewogs* (group of villages), PBCRGs were gradually rolled out to up to 100 *gewogs* with support from the European Union. The Government of Bhutan continues to work to institutionalize the PBCRGs and ensure a sustained flow of finance into the mechanism from various sources, with support from LoCAL.

Countries are also supported in efforts such as getting national entities accredited to vertical funds such as the Green Climate Fund (GCF). To date, three national implementing entities engaged with and/or supported by LoCAL have received GCF accreditation: Benin's National Fund for Environment and Climate, Cambodia's National Committee for Subnational Democratic Development Secretariat, and the Bhutan Trust Fund for Environmental Conservation. LoCAL is also supporting the GCF accreditation efforts of national implementing entities in Mali (the Local Authorities National Investment Agency), Niger (the National Agency for Local Authority Funding), Tanzania (President's Office – Regional Administration and Local Government) and the Bhutan National Bank.

LoCAL supports national and regional accredited entities across 14 countries in Africa, Asia, and Pacific to access Adaptation Fund and GCF funding for a pipeline of approximately €175 million, which is in addition to the €125 million mobilized by the end of 2021 from bilateral partners, largely the EU and its Member States.

Investing in Local Capabilities

Through its activities, LoCAL provides technical and capacity-building support in areas such as:

- Climate risk assessments to inform local adaptation planning and mainstreaming.
- Integrating adaptation in a participatory and gender-sensitive manner in local development planning and budgeting processes.
- Developing, selecting, and implementing adaptation measures.
- Policy and institutional strengthening.

These measures support sensitization of communities on climate change issues, encourage participatory approaches to resilience building, and reinforce bottom-up responses for LLA.

In Lesotho, for example, a 2022 training workshop on climate change mainstreaming, adaptation plans and the LoCAL mechanism took place in the Mohale's Hoek district with 30 participants from district technical teams, line ministries and non-governmental organizations. The training's objective was to improve participant awareness and capacity related to climate change risks and impacts, adaptation, and resilience planning. Participants pass their knowledge to their community councils, supporting mainstreaming climate change considerations into their development plans.

In Mali, 200 community representatives were sensitized on, and exposed to, issues related to climate change and natural resource-induced inter-communal conflicts, and on locally led measures that could be put in place to prevent them. Workshops were held with the four local governments engaged with LoCAL in the Mopti and Kayes Regions, through collaboration with YAGTU – Association for Women's Promotion, a local non-governmental organization. More than 70% of the participants in these workshops were women and youth.

Understanding Risks

LoCAL supports local climate risk assessments to inform adaptation planning and mainstreaming locally. A climate risk assessment methodology

for subnational adaptation was designed with support from the Korean Environment Institute and is being shared with several LoCAL countries with support from the NDC Partnership Climate Action Enhancement Package and other partners. The methodology supports the mapping of climate risk exposure and vulnerability hotspots at subnational and local/community levels; and prioritizing climate change adaptation actions and investments based on quantified and scientific-based analysis.

LoCAL is also piloting a Local Information System for Adaptation (LISA) in cooperation with the Centre de Suivi Ecologique, Senegal, to enable local governments to set a climate risk and vulnerability benchmark and regularly update data for a risk-informed local planning process. LISA is built on in-depth diagnostics of local capacities, successful existing experiences and local knowledge (on information systems and/or similar devices), identification and collection of data from available databases, down-scaled climate models, and a set of indicators of climate and non-climate drivers of risks and vulnerabilities at the local level. Once finalized, the system allows local governments to set a climate risk and vulnerability benchmark and regularly update data to ensure a risk-informed local planning process.

In Ghana and The Gambia, LISA is proving to be a useful resource to advance awareness and understanding of climate trends and properly factor in climate and environmental risks into participatory decision-making processes. It will also

support central governments in taking sub-national climate risks and impacts into account, for NAPs, NDCs and other national assessments of climate risks. Climate Risk and Vulnerability Assessments (CRVAs) for subnational adaptation, including downscaled modeling have also been developed in Niger, Mali, Sao Tomé e Principe, and Uganda. Each comprehensive CRVA takes 9-12 months to develop.

Flexible Programming and Learning

The LoCAL approach is based on regular performance assessments and deployed in phases to allow for flexible programming and learning. From early LoCAL activities in Bhutan and Cambodia a decade ago, to recent engagement in Senegal and Tunisia, experience shows the importance of programming flexibly and taking stock in between phases to ensure successful transitions from piloting to scaling up.

During the phases, annual performance assessments help identify areas for improvements. Annual Performance Assessments are conducted by neutral third parties, who consult with government and technical experts, local government authorities, and community representatives. Continued support is also provided, to ensure that the PBCRGs can be adjusted at key moments based on lessons learned and changing needs.

An Assessing Climate Change Adaptation Framework (ACCAF) has also been developed in partnership with the World Resource Institute, as an adaptation monitoring and evaluation framework.

The ACCAF Manual includes a simple template with a standardized set of steps to arrive at the adaptation rationale. It includes five categories of adaptation interventions: climate specific; climate smart; climate strategic; climate complementary; and awareness and capacity building. Based on the adaptation intervention, ACCAF introduces a standard set of primary output indicators to apply to each intervention. Countries are increasingly integrating the ACCAF in their own systems and using it as a monitoring, reporting and verification tool for the vertical integration of NDCs and NAPs.

An e-tutorial and training program has been developed and delivered in local languages, with the United Nations Institute for Training and Research, to ensure that local stakeholders have a sufficient understanding of LoCAL.

Transparency and Accountability

The PBCRGs allow for stronger and more transparent government financial systems, as the grant indicators, or minimum conditions and performance measures, typically include a number of good governance indicators.

These are related to, among other items, public financial management, procurement, transparency and accountability, as well as measures that promote participation and equality. By scaling up LoCAL across and within LDCs, and other vulnerable countries, it is expected that more transparent and accountable systems for channeling climate finance for LLA will be developed. LoCAL has been recognized as an

"initiative supporting domestic national budget systems to target adaptation actions at the local level, while reinforcing transparency and reporting through those systems" by the Standing Committee on Finance under the UN Framework Convention on Climate Change.[107]

If a local government does not meet the minimum conditions for the following year, it will not receive the grants, but will receive support in identifying and implementing corrective actions and targeted capacity building. This approach avoids parallel, project-specific operations, and supports strengthening of national systems that facilitate future scale-up and can attract additional funding, by promoting transparency and accountability. As of 2021, 221 local authorities, or 71% of the local governments actively using the PBCRG system, have met the minimum conditions without the need of corrective measures.

Efforts to promote transparency and accountability are also supported through training on these issues. In 2021, for instance, a series of district-level workshops were held in the four provinces of Gaza, Inhambane, Nampule, and Niassa in Mozambique, on participatory and gender-sensitive planning for climate change adaptation. These covered prioritization methodologies for resilience-building interventions, and considerations related to investment management such as procurement and infrastructure operations and maintenance. Workshop participants included representatives from district technical teams, consultative councils and civil society organizations.

Overall, 965 people benefited from the capacity-building support.

Collaborative Action and Investment

Flow of funds under LoCAL are designed to ensure that grants are, to the extent possible, channeled through established systems, rather than parallel or ad hoc structures. Synergies are identified during the LoCAL design phase and coordination followed through implementation. LoCAL ensures synergies and complementariness with actions that support NDCs and NAP implementation at local and community levels; and contribute to creating an enabling environment for climate finance decentralization and direct access to international climate funds for LLA.

LoCAL has been supported to date by 34 different sources of finance, which include EU and Member States, partner governments from the global South, UNCDF and other UN partners.

Depending on country and local contexts and resilience building priorities, implementation might require collaboration with other UN agencies (such as the International Trade Centre in The Gambia, or the UN Development Programme in Bangladesh); local NGOs (such as YAGTU - Association for Women's Promotion in Mali or SOS Children's Villages in Ghana); enterprises (such as Recycle Up, and Zeepay in Ghana); and specialized technical organizations, academia and private companies.

Supporting the GGA

While LoCAL pre-dates both the Global Goal on Adaptation (GGA) and the 2015 Paris Agreement where the need for such a Goal was identified, the mechanism supports the process of measuring progress towards such a Goal.

The UNFCCC's Adaptation Committee defines the process of assessing collective progress towards achieving the GGA as "*a process of measuring the direction of travel in terms of enhancing adaptive capacity, strengthening resilience, and reducing vulnerability*".[108]

LoCAL supports progress towards the GGA by:

- Supporting standardized methodologies to measure adaptation and track resilience at the local level, including through ACCAF.
- Increasing awareness and building adaptive capacity at the local level.
- Integrating climate change adaptation into local government planning and budgeting in a participatory and gender-sensitive manner.
- Increasing the financing available for LLA through local governments.

Key Learning

Local delivery systems can be very effective if durable, robust and transparent systems are in place. This includes the capacity of local governments for public financial management, to meet minimum conditions for effective use of the funds. With appropriate support and technical assistance, local delivery systems can ensure that more climate finance reaches the local level, where it is most needed.

In the areas in Bangladesh and Mozambique implementing Phase II of LoCAL, for instance, 70% of LoCAL finance is channeled to the local level. Starting from relatively low capacity levels, including limited staff and logistical challenges, *kaupules* (island councils) in Tuvalu were able to meet minimum conditions to access funding through performance-based grants.

Risk informed planning requires both local and scientific knowledge. LoCAL adaptation efforts need to be informed by localized climate risk assessments that integrate both climate data and local knowledge. The participation of local communities and vulnerable groups is integral to successful planning and implementation. They also need to be informed by feasibility studies and technical designs that link climate change interventions to planning and budgeting processes. These studies can generate investment menus and identify measures that are clearly climate related.

Implementation of adaptation measures can be a vehicle to stimulate the local economy. Involving communities not just in planning but also in implementing and managing adaptation measures can stimulate green local economies and job creation, while boosting wages. For instance, community contracting was used a delivery modality by the communes in Niger to rehabilitate ecosystems, employing youth, women and other vulnerable groups. In The Gambia, Cash for Work interventions are

managed by local governments across 20 wards and will soon be expanded to 32 wards. Participants are acquiring skills while becoming increasingly involved in intra-household and community decision-making processes, while diversifying their livelihoods. The same model is applied in Ghana.

Systems of delivering climate finance locally need to be anchored in diverse institutions. LoCAL works with ministries and agencies dealing with climate change, decentralization, and finance. An inter-ministerial committee is constituted to provide strategic guidance and supervision and to bring together other sectoral ministries and directorates to ensure a shared trajectory on local resilience building, complete ownership, institutionalization, and longer-term sustainability.

Performance-based systems need long-term policy support. Policy support is necessary to institutionalize the new mechanism, and policy making should be informed by field experience. The Government of Bhutan, for instance, has indicated that the LoCAL mechanism has influenced Bhutan's entire national planning process, to move from an 80:20 ratio to a 50:50 ratio for national and local resource allocation, to channel more funds to the local level, and launch performance criteria that replicate those of the LoCAL mechanism.

Knowledge sharing and South-South exchange are crucial to highlight results and impacts, and to access a wider pool of climate financing in the long term through demonstrated success. In this context, strong national and local government commitment to experience

sharing and outreach to various partners increases the chances of a country's ability to scale up such initiatives. LoCAL promotes such efforts through a network of highly committed ministers, who take on the role of LoCAL Ambassadors.

Clear ways to measure adaptation is key. Adaptation measurement remains challenging and clear methodologies can help differentiating between 'development' and 'climate' interventions. Common methodologies for monitoring and evaluation, including indicators, data collection, and metrics to assess progress across localities and countries can support efforts to assess progress on the Global Goal on Adaptation. LoCAL countries have worked on developing PBCRGs into an ISO standard based on ACCAF, to help local stakeholders articulate why and how the interventions address adaptation. The experience with Climate Risk Vulnerability Assessments, PBCRGs ISO standards, and ACCAF can contribute to developing these common methodologies.

Predictable and long-term funding is necessary to maintain adaptation benefits. With assured funds, communities are able to plan and realize actions that have large-scale impact at the local level. The LoCAL Facility has committed to at least doubling its funding size by 2025, and possibly reach an ambitious target of becoming a €500 million mechanism by 2027. Partnerships and options to fast track the LoCAL mechanism through vertical funds such as the GCF and Adaptation Fund and bilateral donors are being pursued.

Chapter 8
Channeling Global Finance for LLA

Photo Credit: Adaptation Fund

KEY MESSAGES

- The Adaptation Fund has pioneered a Direct Access modality and launched an Enhanced Direct Access window to devolve adaptation finance to the national and sub-national levels.

- The Fund has supported access by vulnerable communities and individuals by channeling climate finance to the local level, including through a Small Grants Facility in South Africa and an Adaptation Fund Climate Innovation Accelerator.

- The Streamlined Accreditation Process allows small National Implementing Entities (SNIEs), who would not otherwise be accredited, to demonstrate their capacities to manage smaller amounts of climate finance.

- Peer-to-peer learning opportunities for SNIEs and National Implementing Entities are encouraged and supported, including through a Community of Practice for Direct Access Entities in partnership with the Green Climate Fund.

Devolved decision making

Addressing structural inequalities

Patient, predictable, accessible funding

Investing in local capacities

Building understanding

Monitoring, evaluation, and learning

Transparency and accountability

Collaborative action

The Paris Agreement emphasizes the importance of simplified access modalities for climate finance, and the involvement of smaller, local actors in delivering climate solutions. Adaptation finance, in particular, needs to be easily accessible by communities that are most vulnerable to climate change; and be flexible, patient and predictable to unlock effective local adaptation action.

Delivering funding to support local adaptation is, however, a major challenge for global funds, which traditionally channel finance through national governments for projects at the national level.

The access modalities of global funds are not usually designed for local adaptation practitioners, who have limited capacity for proposal development, and whose needs may be too small to justify the complicated and costly procedures in accessing grants.

Global funds also often lack flexibility, a quality needed when interfacing with varying local contexts and capacities. After funding is made available, local actors must address another wave of challenges associated with the capacity to meet reporting requirements. As a result, practitioners may become preoccupied with meeting compliance requirements – to the exclusion, and sometimes detriment, of strengthening organizational capacities, community ties, and expression of voices from the ground.

Established under the United Nations Framework Convention on Climate Change (UNFCCC) to fund adaptation in developing countries, the Adaptation Fund is financed primarily through government donors, supplemented by the assignment of a two percent share of proceeds from Certified Emission Reductions credits issued under the Kyoto Protocol's Clean Development Mechanism projects. The

Adaptation Fund also formally serves the Paris Agreement and will receive a share of proceeds under its sustainable development mechanism when that becomes operational.

Over the last 13 years, the Adaptation Fund has committed nearly US$ 912 million for adaptation and resilience projects, for over 33 million beneficiaries. The Fund recognizes the need to centralize the role of local communities in decision making throughout the process, from planning and design to implementation. In July 2021, it joined 70 governments and organizations to officially endorse the Locally Led Adaptation (LLA) Principles.

Processes and Modalities That Promote LLA

In addition to an Environmental and Social Policy, adopted in 2013, and Gender Policy & Action Plan, the Adaptation Fund has pioneered several modalities to simplify and enhance access to climate finance, support local capacity to access finance, and promote inclusion.

Direct Access
The Adaptation Fund pioneered an innovative Direct Access mechanism as part of its initial design to make climate

finance more accessible to national governments. Under this modality, National Implementing Entities (NIEs) receive finance without having to go through multilateral or regional agencies. This arrangement empowers government and non-government entities that are closer to local actors to manage all aspects of climate adaptation and resilience projects, with greater flexibility to prioritize national and local needs.

To become accredited as an NIE, the entity requires a nomination from the Designated Authority of any developing country party to the Kyoto Protocol to submit an accreditation application for consideration. Applicant entities undergo a rigorous review by the Accreditation Panel to ensure adherence to sound fiduciary and safeguard standards, resulting in a recommendation to the Adaptation Fund Board. These recommendations are based on a set of standards that cover legal status, financial and management integrity, institutional capacity and transparency and anti-corruption.

Accreditation as a NIE puts national governments and institutions in the driving seat during the design and implementation of projects, while building national institutional capacity to access and manage climate finance from other sources. It contributes to institutional strengthening by helping entities to improve understanding of fiduciary standards; identify areas to bolster financial management and accountability; build capacity to foster environmental and social principles and gender equality in projects; shift from developing projects with outside entities to developing them from within country; and improve

governance by instituting policies against fraud and corruption.

Currently, the Adaptation Fund has 34 NIEs, of which 50% are in Least Developed Countries (LDCs) or Small Island Developing States (SIDS), with projects in 22 countries expected to benefit 2,394,762 individuals.[109] All NIEs are mandated to develop a results framework to ensure that interventions deliver economic, social, and environmental benefits. These specific criteria form a first step towards ensuring that local level actors are involved in decision making processes.

Enhanced Direct Access

In 2019, the Adaptation Fund Board responded to increasing stakeholder interest to further localize climate finance by approving a funding window for Enhanced Direct Access (EDA), to devolve decision making – not just to the national level, but also to the sub-national level.

EDA allows programmatic access to funding by NIEs, tied to broad programmatic objectives rather than specific project activities. This allows more flexibility for local actors and organizations to use the funds to prioritize their evolving adaptation needs. Under EDA, the screening, review, and selection of projects is done at the national and sub-national levels, with stronger stakeholder engagement in the decision-making process.

For instance, the South African National Biodiversity Institute (SANBI) received US$ 2.44 million from the Adaptation Fund's EDA mechanism to establish a

What success looks like in Mamanyoha Village, Mopani District, South Africa. Beneficiaries of the Small Grants Facility show off their produce from a communal garden.

Community Adaptation Small Grants Facility (SGF). The SGF awarded grants of varying size (US$ 100,000 on average) through 12 community-based organizations (CBOs) for vulnerable communities in the Mopani and Namakwa District Municipalities in South Africa.

The funds were provided to address three priority needs of vulnerable communities in these districts:

- Climate Smart Agriculture
- Climate Proof Settlements
- Climate Resilient Livelihoods.[110]

A national-level financial mechanism was established, with a Project Advisory Group and National Advisory Board,

which issued a call for proposals through networks and the media (radio and newspaper). A briefing session for interested applicants followed, after which potential applicants were offered the option of receiving additional technical assistance to complete proposals.

Completed applications were reviewed by at least three technical experts on the District Technical Advisory Groups, and a shortlist was presented for endorsement by the Project Advisory Group and approval by the National Advisory Board.

Partnerships among academia and research institutions, as well as local governments and CBOs, were established to help shape the design of smaller

projects. A high level of inclusivity was sought during the design stage, which required additional allocation of funding to support community engagements, often in local languages. Efforts were also aimed at empowering local institutions to identify and implement adaptation response measures.

Under the EDA mechanism, activities are implemented by the sub-national applicants for funding (usually grassroots groups), also called Executing Entities, who are the expected to take on the role of project administration (such as contract management and reporting).

However, some Executing Entities, particularly in the Mopani District, lacked the administrative and financial capacity to receive and manage funds. This issue was addressed in the SGF by assigning Facilitating Agencies to the Executing Entities.

Facilitating Agencies were selected on the basis of specific prior experience in operating small grants for development projects in climate change adaptation, to provide technical and financial support directly to the small grant recipients. Communities and Executing Entities retained control and decision-making authority for the operational aspects of project delivery, while the Facilitating Agency managed the project financial resources on their behalf, including procurement. The cost of assigning Facilitating Agencies was often minimal as they were already in place. The project administration budget was extended from 10% to 15% to provide for the additional overhead costs.

Photo Credit: SANBI

Rainwater harvesting system and storage tanks installed through the Small Grants Facility project in the Suid Bokkeveld, Namakwa District, South Africa.

Photo Credit: SANBI

Heat and drought tolerant livestock introduced in the Leliefontein and Kamiesberg communities in South Africa.

The Facilitating Agencies also established Technical Advisory Groups to ensure that project proposals were locally contextualized and technically robust. These Technical Advisory Groups included representatives from selected provincial and local government departments and relevant adaptation experts from research and academic institutions.

For instance, the Namakwa community received a SGF grant for the Concordia Farmers Adaptation Project to construct multipurpose shelters with rainwater harvesting systems, to protect farmers and their livestock from increasing temperatures and subsequent heat.[111]

Concordia Farmers chose to have a Facilitating Agency to administer the grant, so SouthSouthNorth Trust was assigned to this role. An agreement between the two clearly described the responsibilities of each party. Concordia Farmers was responsible for undertaking the activities described in the approved project proposal, while ensuring that the intended beneficiaries were involved in decision-making regarding the day-to-day operations and contributed to the implementation. SouthSouthNorth Trust received the funding on behalf of Concordia Farmers, and was responsible for project administration, financial management, and the delivery of capacity-building interventions.

The inclusion of Facilitating Agencies was not without its challenges, at times causing miscommunication and delays due to multiple cascading lines of reporting. The project management team acted with flexibility by adapting reporting requirements. In one example, the Facilitating Agencies provided more intensive support early in each quarter and undertook informal check-ins on progress and reporting. That shift enabled a reduction in the frequency of written reporting from grant recipients to Executing Entities. This demonstrates the value of instituting simple and effective procedures as key to effective project management across administrative layers.

Capacity challenges related to project execution, including for contracting,

oversight and reporting, were identified and significant time and effort was invested in developing capacities throughout, while recognizing local and Indigenous knowledge and the need for gender mainstreaming. As a result of those investments, however, local organizations are now better prepared to exercise leadership in future adaptation planning and implementation.

The four-year pilot was extended to almost six years to accommodate unforeseen delays (2014-2021) due to early project setup and COVID-19 restrictions impacting implementation on the ground. A proposal to scale up the SGF pilot into a Locally Led Adaptation (LLA) Grant Facility has now been submitted to the Green Climate Fund.

Readiness Programme

The Adaptation Fund launched a Readiness Programme for Climate Finance in 2014, to strengthen the capacities of national and regional entities to receive and manage climate financing.

Initially, Project Formulation Assistance (PFA) grants of up to US$ 20,000 were available per project to help NIEs access external expertise for specific technical assessments (such as environmental impact assessments, vulnerability assessments, risk assessments, gender studies and other environmental and social assessments). These were discontinued as of October 2021, and the PFAs were incorporated into existing Project Formulation Grants (PFGs), initially US$ 30,000 per project, by raising them to US$ 50,000.[112]

Readiness support is also available to help entities to become accredited as NIEs, through an improved grant program for South-South cooperation and peer-to-peer support. US$ 150,000 is available to help potential NIEs address specific capacity gaps in technical areas such as fiduciary compliance and environmental and social safeguards. Experienced NIEs are matched with aspiring NIEs to support them in accreditation, project development, management of environmental and social safeguards, and knowledge management.

Improvements have been made in this process recently through the introduction of mandatory pre-screening and assessment of capacity needs, and more detailed pre-identification of possible solutions to address identified gaps.

The Adaptation Fund also supports the Community of Practice for Direct Access Entities (CPDAE) in partnership with the Green Climate Fund (GCF). CPDAE is a global network of the Adaptation Fund's NIEs, and the Direct Access Entities of the Green Climate Fund (GCF), accredited to receive funding through the Direct Access modalities of both funds. The CPDAE has raised €1.2 million through joint support from the Adaptation Fund and GCF, to implement the CPDAE two-year Action Plan.

The Adaptation Fund's Readiness Programme provides supports to NIEs post-accreditation, through webinars, seminars and country exchanges for knowledge exchange, learning and experience sharing, collaboration and peer support to increase their effectiveness in accessing resources and implementing projects and programs.

The Programme and CPDAE have proven to be an important component in decentralizing decision-making in climate finance towards the local level, by empowering NIEs and executing entities to share best practices, discuss challenges, and promote the participation of grassroots actors.

Streamlined Accreditation Process

The Adaptation Fund Board approved a Streamlined Accreditation Process (SAP) in April 2015, to allow NIEs to demonstrate their capacities to manage smaller amounts of climate finance. While there are no changes to the fiduciary requirements or accreditation criteria for SAPs, the Adaptation Fund applies appropriate mitigating measures, controls, and practices for smaller aspiring NIEs to demonstrate their required competencies without exposing the Adaptation Fund to additional risks.

SAPs rely on five elements:
- An assessment of the potential risks for the Adaptation Fund by supporting a project based on the capacity and nature of an NIE.
- Identification of alternate ways to meet requirements related to fiduciary standards.
- Added flexibility for an applicant to show how it uses mitigating measures to meet the spirit of the fiduciary standards.
- Reduced time and effort for the applicants to go through the accreditation process.
- Alignment where possible with the fit-for-purpose approach of the GCF.

Five smaller NIEs (SNIEs) have been accredited so far, from the Federated States of Micronesia (accredited in 2015), the Cook Islands (2016), Armenia (2016), Tuvalu (2019), and Honduras (2021). The SAP also helped these SNIEs to access climate finance from other bilateral and multilateral entities – three of the five SNIEs are also accredited to the GCF through a mutual fast-track arrangement between the two global funds.

The organizational structure, size and track record of the accredited organizations would not have allowed the SNIEs to be accredited without the flexibility provided by SAP, whose requirements better reflect their capacity, risk profile and ability to handle projects. While the amount of funds an SNIE can access is limited, the SAP promotes a learn-by-doing approach to gradually increase their capacity. SNIEs can request increases in funding limits by showing improvement in their institutional capacity within five years of accreditation.

For instance, the first NIE approved through the SAP, in 2015, was the Micronesia Conservation Trust (MCT) from the Federated States of Micronesia.[113] MCT has remained compliant with the criteria for a streamlined process of accreditation, while strengthening its policies and procedures to align with best practices and to the Adaptation Fund's policies, according to a review of the SAP.

MCT has also demonstrated its capacity to manage projects of much larger amounts and the related risks. The review highlights MCT as "*a major*

success" that has *"not only continued to build its institutional capacity but has also succeeded in accessing and implementing climate finance to the benefit of the most vulnerable communities it serves".*[114]

MCT, in turn, has gone on to support local access to finance from the Adaptation Fund, by supporting community projects across the four FSM states through a Small Grants Facility. The projects support stakeholders (including community representatives, women's groups, municipal, state, and national government representatives, and NGOs) to conduct vulnerability assessments, develop practical solutions, and monitor and evaluate progress.

However, it has still proven to be challenging to provide patient and predictable funding, given the small and time-bound nature of the funding it received from the Adaptation Fund. MCT had given out small grants ranging from US$ 10,000-50,000, for up to 18 months.

To support others to receive SNIE status, MCT has created a peer-learning network in Micronesia for other organizations, to help them learn how to access climate finance from the Adaptation Fund and GCF.

The review of SAP noted that the timeframe and effort needed for accreditation through the streamlined process has been similar to the regular accreditation process. Many SNIEs have major gaps that require time to develop a successful track record prior to accreditation, and often have less staff so may need more time to demonstrate they can meet criteria that is commensurate with their individual size and capacity.

The SAP is an opportunity for smaller organizations to enter the streamlined process, but only five of Adaptation Fund's 34 NIEs to date have been accredited this way. While a country's designated authority can nominate an NIE applicant under the streamlined process, this option has not been used to date, possibly due to a lack of awareness. Smaller NIEs have usually applied through the regular accreditation process and then switched to the streamlined process on the advice of the Adaptation Fund secretariat.

Adaptation Fund Climate Innovation Accelerator

The Adaptation Fund announced a US$ 10 million Adaptation Fund Climate Innovation Accelerator (AFCIA) under its Innovation Facility in late 2019, to foster innovation of adaptation practices by NGOs, community groups, young innovators and the private sector in vulnerable countries.

The Program is administered by the United Nations Development Programme (UNDP) and United Nations Environment Programme (UNEP). Each administers US$ 5 million, to provide 45 small grants of US$ 250,000 each. The Climate Technology Centre and Network (CTCN), which is the operational arm of UNFCCC Technology Mechanism, works in conjunction with UNEP as an executing entity in the AFCIA.

AFCIA funding is also available, on a competitive basis, in developing countries that do not yet have NIEs.

An Innovation Small Grant Aggregator Platform (ISGAP) under AFCIA for the 2020-2024 period develops and diffuses innovative adaptation practices, tools, and technologies that will result in improved climate resilience of the target beneficiaries. Its eligibility criteria are designed to ensure that local actors can play a lead role in piloting new and untested techniques, technologies, and approaches to adaptation.

ISGAP can provide 15-20 microgrants (US$ 60,000 for a two-year cycle) and 10-15 small grants (US$ 125,000 for a two-year cycle) to NGOs, CBOs, business member associations, cooperatives etc., registered in a developing country. Grantees could receive another round of funding if they reach the milestones proposed for the first cycle. ISGAP is also providing grantees a pathway to scale, either through public funding projects or through potential private funding channels brokered by UNDP and partners.

For instance, *Bukidnon Umayamnon Tribe Kapu-Unan To Mga Datu* (BUKDA), an indigenous tribe in the Philippines, has received US$ 60,000 under AFCIA to plant giant bamboo and cacao along the Pulangi riverbank as an adaptation, mitigation, and poverty alleviation measure. Ten hectares each of bamboo and cacao have been planted so far.

In addition to being efficient in the sequestration of carbon emissions, the giant bamboo produces edible bamboo shoots within three years of planting, and marketable mature bamboo culms within six years, for up to 35 years if managed sustainably.[115]

Under the project, training has been provided on bamboo propagation, nursery operation and maintenance, and plantation establishment, protection, and maintenance. To support vulnerable communities during COVID-19, the project has also provided temporary employment.

The project is governed by the BUKDA Council of Elders, whose members represent all the clans in the Development Areas situated in sub-watersheds or river catchments of the BUKDA Ancestral Domain. The Council is responsible for all major decisions, including the distribution of benefits and resources. A sharing arrangement will ensure inter-generational transfer of benefits and responsibilities.

An AFCIA grant has also been provided to 15,000 climate vulnerable families in Rio Grande do Sul, southern Brazil. The families (including smallholders, the *Guarani* Indigenous Peoples, and the *Quilombola*) face social exclusion, livelihood stress, poverty, and food insecurity. All these issues are made worse by climate change, and the recent rise in food prices.

An 18-month AFCIA grant project, implemented by Centro Ecológico and supported by the Ecovida Agroecology Network, aims to replace agricultural intensification with agroforestry systems to grow, process and market *açaí* berries. Key stakeholders include farmers and their representative organizations (including *Movimento das Mulheres Camponesas* or the Movement of Female Peasants, and Movimento *dos Pequenos Agricultores* or the Smallholders

Movement); government agencies, NGOs, universities, and other partner organizations; and market agencies, including shops, supermarkets, market representatives, and consumers.

Conclusions

Instead of expecting severely capacity-constrained vulnerable groups to be able to reach out to global climate funds, the Adaptation Fund has constantly innovated, from its inception, to reach climate vulnerable groups and to improve national and sub-national access to climate finance.

These innovations have created new pathways to provide climate finance to the most vulnerable, and at the same time highlighted the many challenges that need to be overcome to take climate finance to where it is most needed. Accrediting small institutions to access and disburse funds further through national small grant facilities; aggregating needs that are individually too small; and supporting peer-to-peer learning are all important steps in this direction, worthy of emulation by other global and national climate funds.

At the same time, further investments and innovations are necessary to improve the capacity of communities and their local representatives to access and manage adaptation finance, and to plan, implement and monitor adaptation activities. Further innovations are also necessary by global funds and funding partners, in partnership with recipient countries, to address issues related to the fragmentation, flexibility, and predictability of climate finance for vulnerable local communities.

Chapter 9
Measuring Resilience for LLA
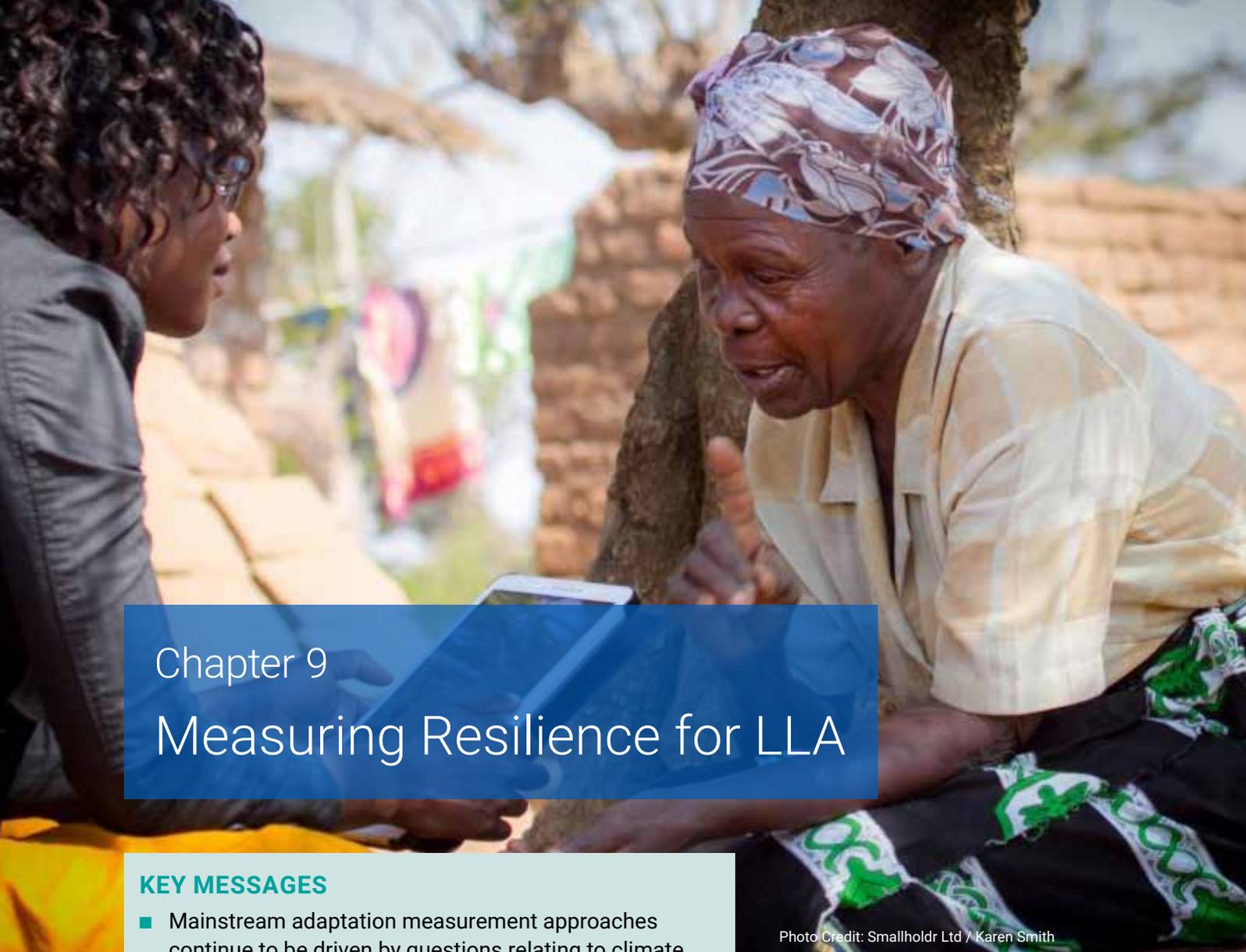
Photo Credit: Smallholdr Ltd / Karen Smith

KEY MESSAGES

- Mainstream adaptation measurement approaches continue to be driven by questions relating to climate risks and impacts, rather than of equity, justice, and power dynamics that drive the vulnerability of communities.

- Communities are change agents who need data from measurement approaches to make good decisions. Resilience measurement approaches must consider their needs.

- Along with funding, programming and measurement will also have to undergo paradigm shifts in approaching LLA.

- Communities and local policymakers have called for the need to use stories of lived experiences, processes of adaptation, and co-production of knowledge on LLA to capture nuances in changes, and to track progress.

- Citizen science can address issues of data scarcity as well as downward accountability. The process of learning and feedback into policy and research through citizen science can challenge existing structural inequities within LLA initiatives, while empowering key stakeholders.

Devolved decision making

Addressing structural inequalities

Patient, predictable, accessible funding

Investing in local capacities

Building understanding

Monitoring, evaluation, and learning

Transparency and accountability

Collaborative action

Vaishali *tai*, a rural farmer from Kondhwal village, stands on her farm and looks out across the Dimbhe Dam on the fringes of the Bhimashankar Wildlife Sanctuary, in the western Indian state of Maharashtra. The sanctuary is important. It is home to the endemic Malabar Squirrel, and a sacred religious space. There is a temple in the Sanctuary dedicated to the groundwater spring that forms the source of the Bhima River and to the Hindu god Shiva, revered by Vaishali's forest community and beyond. Vaishali and her husband directly depend on the sanctuary and its resources. As subsistence farmers, they rely on soil moisture and rains to grow their native cereal and lentils.

The river's water, Vaishali believes, is for the bigger farmers who grow sugarcane. While Vaishali has been historically victimized under the garb of encroachment and is highly vulnerable to the impacts of climate change, she still holds aspirations for her children to have better lives in the nearby Pune city. What kind of information would help Vaishali negotiate for a better future?

This chapter explores the challenges, opportunities and ways forward for measuring resilience, tracking progress, and using that information to support people like Vaishali to make decisions, helping them navigate the uncertainties of complex, nested challenges of climate change shocks and chronic stresses in their contexts.

The first section posits the theoretical framing for the challenges and opportunities to measure LLA initiatives. It identifies three key tenets for tracking progress of the LLA initiatives: the role of contribution-led, bottom-up, and mixed methods approaches to measure LLA; the role of funding in facilitating local agency and co-producing solutions; and the role of science and data in local-scale risk-based decision-making.

The second section articulates principles and priorities identified as a part of the Advancing Resilience Measurement experts meeting in May 2022 on demand-driven resilience, psychosocial resilience and well-being, systems-level resilience and climate adaptation and resilience. In conclusion, the agency, evidence, learning, and knowledge needs of communities have to be centered when evaluating LLA initiatives.

Measuring LLA

The measurement of climate change adaptation is affected by challenges of assessing attribution, identifying baselines, and monitoring indicators over a long time horizon. However, historical power structures in funding, design, and evaluation of adaptation and resilience programs have affected the agency of local and indigenous communities in most world contexts.

The LLA Principles are an attempt to shift power towards local actors with improved access to finance, agency in addressing structural inequities, and improving learning processes.

Adaptation and resilience initiatives are situated within complex systems, with

highly localized processes and solutions. A recent stocktake of climate adaptation literature has noted the overall lack of transformational change and little evidence of reduction in risk outcomes. Further, the IPCC Working Group 2 report points to the need for climate resilient pathways to anticipate and navigate change through growing uncertainty. Thus, measuring transformation at the scale of LLA initiatives, where actors can anticipate and embrace uncertain futures while using measurement to learn and navigate change, remains a challenge.

This section highlights three key challenges and opportunities in measuring LLA initiatives: the inherent limitations of attribution-led tools and approaches; the role of funding and program design in driving measurement approaches; and the role of science and data in not only identifying risk, but also determining action for LLA initiatives.

Limits to Existing Tools and Measurement Approaches

Many resilience measurement approaches have focused on quantitative metrics, assessing effectiveness using indicator-based tools and in some cases, impact assessment frameworks. For instance, the role of Randomized Control Trials (RCT) in informing farmers' choice of inputs, credit, and payments is well understood in literature.

While these tools are extremely useful in designing policy instruments and identifying specific solutions that are effective, research indicates that there are limits to the effectiveness of these tools, especially in data scarce contexts.

For instance, the satellite based Normalized Difference Vegetation Index (NDVI) indicator of greenness for nature-based solutions does not differentiate between native and invasive vegetation.

Photo Credit: Kiara Worth

Coproduction of knowledge is necessary to track progress on LLA.

It is therefore only a partially effective tool in measuring resilience of people and nature in contexts where data around vegetation types does not exist.

Instead, communities and local policymakers have called for the need to use stories of lived experiences, processes of adaptation, and co-production of knowledge on LLA to capture nuances in changes, and to track progress.

When considering resilience measurement approaches, it is also important to consider user needs such as early warnings of disasters, availability of resources, etc. There is growing recognition that communities are not beneficiaries of resilience interventions but are, in fact, change agents who need data from measurement approaches to make decisions.

In India, for instance, the Foundation for Ecological Security has created the India Observatory platform to connect mobile-based monitoring of groundwater by local communities, with data synthesis for local level decision-making around planning and allocations for water use.

Existing mainstream resilience measurement approaches, despite being large in number, do not consider the entry points needed for measuring the effectiveness of LLA initiatives. These mainstream resilience and adaptation measurement approaches continue to be driven by climate risks and impacts, rather than questions of equity, justice, and power dynamics that drive the vulnerability of communities.LLA initiatives necessarily require flexible and robust measurement approaches

that help communities navigate change and support communities as actors within complex systems who embrace uncertain futures.

Allowing Innovation, Failure, and Learning

Resilience measurement approaches that are driven by impacts and attribution are rigid in measuring indicators for capacities and capitals. These indicators for capacities (coping, adaptive, transformative, anticipatory) and capitals (natural, social, physical, financial) that make up resilience are driven by different entry points, including funding priorities.

The need for more patient funding is an important LLA Principle. This shift in funding, however, also needs a shift in how measurements are done – they must account for processes instead of outcomes, relations instead of objects, and measure the growing abilities of communities to anticipate, learn from, and embrace uncertainties.

This shift then further needs to be reflected in the way interventions are designed. Climate adaptation approaches require communities to not just adapt, but also learn from the past and remain open to a wide variety of future scenarios of well-being. LLA interventions themselves cannot continue to be solutions-oriented. Instead, they need to be hinged on knowledge co-production and transdisciplinary approaches with a focus on innovation, and with learning mindsets that embrace failure.

Thus, LLA interventions should necessarily be designed with a focus

on identifying a clear process of transdisciplinary and knowledge co-production that supports communities to contextualize and co-create solutions to address the complex challenges they face.

As an example, watershed management interventions such as check dams are important LLA solutions. But they can be effective only if there is a true need for them. This need is not only driven by funding priorities or user demand, but also by co-producing knowledge by experts and communities about the ecosystems' water cycles in the location where the solutions are to be implemented.

This shift, from pre-selected solutions based on funding or ad-hoc user demands to a focus on the process of co-creating contextualized solutions, will also require agility of processes, rather than being locked-in to outcomes within broader project agendas. Thus, along with funding, programming and measurement will also have to undergo paradigm shifts in approaching LLA.

Invest in Science and Data to Outline Risks, and Understand Drivers of Risk and Resilience

The role of science is critical in understanding the impacts of climate change at all scales. Advances in satellite-based measurements, large-scale climate disaster attribution studies, and assessments of planetary boundaries of resources have pointed to the complex interplay between climate change and human exploitation of resources across multiple scales. These biophysical complexities are further nuanced by discussions on power, equity, and the

politics of climate change through the lens of vulnerability across scales. Finally, the discourses on what constitutes science have been broadened with the inclusion of traditional, local, and indigenous knowledge and action in climate adaptation discourses.

Transdisciplinary knowledge co-production processes between researchers, practitioners and communities can act as important vehicles of determining the boundaries of science, power and equity, institutions and governance, as well as local knowledge, norms, practices and customary rights.

An important LLA Principle is the role of science and the need for investment in the identification of risk, especially in data scare contexts. Current mainstream downscaling approaches for projecting climate change heavily downplay the lack of data, especially in large parts of Asia, Africa, and Latin America. This absence of data affects communities' understanding of risks and their ability to enhance their resilience to shocks and stresses.

Alternative approaches such as Decision Scaling, that embrace the uncertainty that lack of data creates, can be mainstreamed in implementing adaptation decisions for LLA interventions through a combination of bottom-up and top-down approaches. Data is essential for effective measurement and more investments need to be made in this regard, ensuring this is relevant for users. Advances in Open Data Kits, mobile apps, and other forms of technology that facilitate citizen science, are a valuable opportunity for investment.

Citizen science can address issues of data scarcity as well as downward accountability within resilience measurement approaches. These approaches have been explored in a wide variety of contexts, such as biomonitoring and ecosystem health, and sustainable agriculture.

While citizen science can create data and strengthen science meant for articulating the climate risk at local scales, learning outcomes for citizen science should be process-driven and evaluated as outcomes rather than indicator-based. The process of learning and feedback into policy and research through citizen science also might have the potential to challenge existing structural inequities within LLA initiatives while empowering key stakeholders.

Principles and Priorities for Resilience Measurement and Evidence

Recognizing these challenges, the Advancing Resilience Measurement meeting, convened by the Global Resilience Partnership (GRP), the University of Arizona, and USAID, was held in May 2022 in Washington, D.C., USA, with about 55 measurement experts in attendance. The objective of the meeting was to refresh and further the collective understanding of emerging opportunities and challenges within the resilience measurement field, and articulate shared principles and priorities for the next three to five years.

Photo Credit: Producers Direct and Global Resilience Partnership

Different evidence users have different evidence needs that require different resilience measurement methods and approaches.

The meeting built on past progress made by the measurement community on advancing resilience measurement, notably the efforts of the Resilience Measurement, Evidence and Learning Community of Practice (RMEL CoP), which provided a collective convening platform for resilience measurement experts.

The Advancing Resilience Measurement meeting built on the Food Security Information Network (FSIN) Principles of Resilience Measurement, which lay out the methodological and conceptual hurdles in measuring resilience while articulating the need for a common forward-looking agenda for resilience measurement.

It also followed a consultation on Demand-driven Resilience at the Gobeshona Conference in March 2022, where some resilience measurement approaches were discussed (such as the Market Systems Resilience Index), and a panel discussion that followed brought out some of the key challenges faced by users of the measurement approaches.

The meeting provided an opportunity for old voices and new, from the global South and the North, to share and learn from each other's experiences on resilience programming and measurement. There was a palpable sense of urgency, recognizing the critical importance of making progress in the way progress is tracked and evidence on resilience is shared. During the meeting, experts discussed four key topics: demand-driven resilience; psychosocial resilience; systems-level resilience; and resilience and climate adaptation.

A key outcome of the meeting was the development of principles and priorities for each of these topics (see Box below), which highlight important considerations that need to be made when measuring resilience.

DEMAND-DRIVEN RESILIENCE MEASUREMENT AND EVIDENCE

PRINCIPLES

1. Engaging evidence users – including communities – in the co-production of knowledge is critical for ensuring resilience measurement and evidence are demand-driven and contribute to strengthening individual and collective agency.
2. Different evidence users have different evidence needs that require different resilience measurement methods and approaches.
3. Mixed methods and approaches help meet diverse evidence needs and reinforce trust and confidence in findings.

PRIORITIES

1. Develop a map and typology of resilience evidence users, uses, and needs at different scales.
2. Connect data and evidence from multiple sources in a resilience information network that, collectively, meets a diversity of evidence needs.

3. Operationalize learning from monitoring and evaluation in (closer to) real time.

4. Improve visualization and translation of resilience evidence in consultation with evidence users to meet their evidence needs.

5. More fully leverage existing, longitudinal data to meet evidence needs.

6. Better demonstrate the effectiveness of resilience projects and programming.

PSYCHOSOCIAL RESILIENCE AND WELL-BEING

PRINCIPLES

1. Psychosocial well-being is a critically important well-being outcome, an enabling condition that facilitates improvement in other well-being outcomes, and a source of resilience that protects other well-being outcomes in the face of shocks and stresses.

2. Culture and context shape people's perceptions and understanding about psychosocial constructs and this must be reflected in how they are measured.

3. Measuring psychosocial resilience and well-being can be sensitive and requires (pre)caution and adherence to do no harm principles.

4. Psychosocial resilience and well-being (like other forms of resilience and well-being) exist and can be measured at different scales.

PRIORITIES

1. Form a technical working group for advancing psychosocial resilience measurement.

2. Conduct a systematic review of psychosocial resilience and well-being measurement tools, methods, and evidence.

3. Further validate the use of existing psychological scales in contexts relevant to resilience and international development, including with communities themselves.

4. Explore the potential for standardization of concepts, tools, and scales while also allowing for cultural and contextual tailoring.

SYSTEMS-LEVEL RESILIENCE

PRINCIPLES

1. Defining a system, its components and boundaries, is a subjective exercise and it is challenging to find the right balance between including a broad range of actors and keeping systems mapping exercises manageable.

2. Defining the determinants or sources of a system's resilience is also subjective and difficult to validate in the absence of systems-level well-being outcomes. A key measurement principle in the foundational 2014 FSIN Resilience Measurement Principles, is that resilience is a capacity that should be indexed to a development (well-being) outcome. This presents an unresolved challenge for systems-level measurement where such outcomes are either difficult to identify or measure, do not adequately represent a system's well-being, or have a high probability of masking unintended consequences and maladaptation.

3. A primary objective for measuring systems-level dynamics and resilience is to understand their impact on household and community resilience and well-being.

4. Systems-level resilience measurement must be highly sensitive to and anticipate unintended consequences and maladaptation.

PRIORITIES

1. Make systems and systems resilience measurement more accessible to a broader range of development stakeholders.

2. Develop a typology of systems and focus future consultations on specific systems to enable a deeper and context specific discussion.

3. Develop a shared typology or categories for the determinants (or sources) of resilience used in relation to specific systems.

4. Consolidate lessons learned on processes for systems mapping, including the incorporation of risks associated with shocks and stresses, and determinants or sources of resilience within the system.

5. Demonstrate the value of systems-level resilience and systems-level resilience measurement to achieving development outcomes.

RESILIENCE AND CLIMATE ADAPTATION

PRINCIPLES

1. Resilience measurement frameworks and approaches provide a means of measuring climate adaptation that complements other approaches and fills a critical gap, particularly at the individual, household, and community levels.

2. Resilience approaches to measuring climate adaptation measure capacities that enable people, households, communities, countries, and systems to adapt to and manage the impacts of climate change without compromising current and future well-being.

3. Climate shocks and stresses occur in complex risk environments in which a range of shocks and stresses are interacting and compounding one another.

4. Flexibility to adapt to a range of potential futures is a source of resilience and form adaptation in the face of an uncertain future.

5. Sustained processes for involving communities in the co-production of resilience and climate adaptation evidence is required. Communities are already adapting, and local and indigenous knowledge and actors are central to the adaptation evidence enterprise.

PRIORITIES

1. Develop measurement and analytic innovations to address unresolved challenges to measuring climate adaptation using a resilience measurement approach.

2. Refine and improve measures of resilience capacities to better reflect t he uncertainty and future orientation of climate adaptation.

3. Greater collaboration and convergence between resilience and climate adaptation measurement communities of practice:

   a. Distill the various approaches used in resilience measurement and climate adaptation for practitioners. One specific recommendation is to develop a practitioner-oriented overview that explains various measurement approaches and how they differ and complement one another.

   b. Conduct measurement exercises with joint resilience and climate adaptation measurement teams, in specific geographies if possible.

4. Further elevate local and indigenous knowledge and actors in resilience and climate adaptation evidence enterprises. LLA Principles, as well as several principles outlined in this report, provide strong statements on the need to do so. However, effectively and meaningfully doing so requires confronting long-standing patterns of power that shape how we perceive and value evidence. Greater intentionality in creating space for diverse perspectives on resilience and climate adaptation evidence is required.

Source: Resilience Measurement Principles and Priorities for Climate Adaptation and Resilience, reproduced from the Advancing Resilience Measurement Consultation Report, 2022

Ways Forward

As a way forward for measuring resilience for LLA initiatives, a number of key considerations are necessary.

Ensuring that the users' needs for evidence are heard: The focus on end-users for resilience measurement data is growing, be it by policymakers or grassroots communities, but challenges remain in identifying ways in which progress can be tracked and evidence repackaged that is suitable to the audience.

One suggestion is to create 'evidence harmonizers' or those who can play the role of translating, synthesizing, amplifying, and re-packaging evidence based on user needs. The Resilience Knowledge Coalition, co-led by GRP, Climate and Development Knowledge Network, and the International Centre for Climate Change and Development, has the potential to serve as a 'network of networks', acting as a bridge between research, policy, practice, and investments. The coalition can act as an effective harmonizer of evidence and has practitioner-oriented guidance on resilience measurement in the pipeline.

Measurement tools are fit for purpose and context: There is an implicit recognition in the expert community that discussions need to move beyond the debate on which tool is the best for resilience measurement. Based on needs and demands from end-users, RCTs, stories, or anything in between can be used to track the impacts and outcomes of resilience programming. Key considerations are the need for open data, the role of citizen science in data-scarce scenarios, and the importance of sharing contextual results with decision-makers (whoever the decision-makers are in that context, whether policymakers or communities).

These considerations necessitate the experts to reflect on the use of the right

tools for right context and purpose when designing measurement for LLA interventions. The Resilience Knowledge Coalition is working with resilience experts from the global South to identify, map and create a decision-tree for resilience measurement approaches and tools.

Capturing agency-in-action from people already coping, adapting, and thriving in the face of change: There is an implicit recognition for the need to move away from techno-centric, straight-jacket approaches to measuring resilience. How to map power dynamics, justice, and equity in resilience measurement are key topics that need to be explored.

The question *"Are we able to capture people's agency to be resilient?"* still seems relevant for the measurement expert community. Initiatives such as Participatory Groundwater and Ecosystem Management in India recognize this agency in the farmers who are changing the way they manage groundwater and enhance community resilience.[116] There are many such community-based

approaches that are challenging the frontiers of how the collective agency of communities is tracked, and many of those stories emerge from the global South, as strongly illustrated by the Voices from the Frontlines initiative.

Ensuring measurement can anticipate the need for a change in direction in an uncertain future: Systems have often been complicated by introducing resilience solutions that have brought about new externalities. Based on these learnings, it is believed that the responsibility is on resilience measurement experts to be able to define pathways, both robust and flexible, that enhance the resilience of communities at risk. However, the ability to track the direction and progress of transition to more resilient pathways is still necessary. New experiments with transitions, futures and complexity thinking, and systems change, such as the Project Urban Living Labs, bring a glimmer of hope to a scenario that has otherwise been exasperatingly slow to change.

References

1   Germanwatch (2021). *Global Climate Risk Index 2021*.

2   Relief Web (2019). *Climate Change-Induced Salinity Affecting Soil Across Coastal Bangladesh*.

3   Rabbani, G., Munira, S., & Saif, S. (2018). Coastal community adaptation to climate change-Induced salinity intrusion in Bangladesh. *Agricultural Economics-Current Issues*. IntechOpen.

4   Rahman, M. M., Giedraitis, V. R., Lieberman, L. S., Akhtar, T., & Taminskiene, V. (2013). Shrimp cultivation with water salinity in Bangladesh: The implications of an ecological model. *Universal Journal of Public Health*, 1(3), 131-142.

5   Lam, Y., Winch, P., Nizame, F. A., Broaddus-Shea, E. T., Harun, M., Dostogir, G., & Surkan, P. J. (2022). Salinity and food security in southwest coastal Bangladesh: impacts on household food production and strategies for adaptation. *Food Security* 14, no. 1, 229-248.

6   WaterAid (2019). *Geospatial database creation for pond resources using remote sensing and GIS*. Presented on 30 Dec 2019. Consultation on 'WASH and Water Security Planning'.

7   Siddique, A. (2021). Investigation: Steady creep of saltwater a risk to women's health in Bangladesh. *The Third Pole*.

8   Khan, A. E., Ireson, A., Kovats, S., Mojumder, S. K., Khusru, A., Rahman, A., & Vineis, P. (2011). Drinking water salinity and maternal health in coastal Bangladesh: implications of climate change. *Environmental health perspectives*, 119 (9), 1328-1332.

9   Pinchoff, J., Shamsudduha, M., Hossain, S. M. I., Shohag, A. A. M., & Warren, C. E. (2019). Spatio-temporal patterns of pre-eclampsia and eclampsia in relation to drinking water salinity at the district level in Bangladesh from 2016 to 2018. *Population and Environment*, 41(2), 235-251.

10 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, & B. Rama (eds.) (2022). *Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Intergovernmental Panel on Climate Change. Cambridge University Press.

11 Pachauri, R. K., & Meyer, L. A. (2014). *Climate Change 2014: Synthesis Report: Contribution of Working Groups I, II and III to the Fifth Assessment Report.* Intergovernmental Panel on Climate Change. Geneva

12 UN-Habitat (2011). *Malawi: Lilongwe Urban Profile*. United Nations Human Settlements Programme (UN-HABITAT), Nairobi, Kenya

13 CCODE (2017). *Kawale floods disaster report.* Center for Community Organisation and Development, Lilongwe, p.2

14 Vincent, K. (2017). *Future climate projections for Malawi.*

15 NSO (2018). *Malawi population and housing census report*. National Statistical Office, Zomba. p.11

16 OECD (2018). *Glossary of Statistical Terms*. Organisation for Economic Co-operation and Development

17 Pachauri, R. K., & Meyer, L. A. (2014). *Climate Change 2014: Synthesis Report: Contribution of Working Groups I, II and III to the Fifth Assessment Report.* Intergovernmental Panel on Climate Change. Geneva. p.15

18 Pfefferbaum, R. L., *et al*. (2013). The Communities Advancing Resilience Toolkit (CART): An Intervention to Build Community Resilience to Disasters. *Journal of Public Health Management and Practice*, 19(3), pp 250-258

19 CCODE (2019). *Mtandire floods disaster report.* Center for Community Organisation and Development, Lilongwe. p.3

20 Mitlin, D. (2008). *Urban poor funds: development by people for the people*. Poverty reduction in urban areas series. IIED, Working paper no. 18, London

21 Chipeta, C. & Kanyumbu, E. (2018). *Determinants of Access to Banking Services in Malawi*. Working Papers, African Economic Research Consortium, Research Department, Zomba

22 Chiweza, A. (2019). *Political economy analysis of urban governance and management in Malawi* Zomba. p.30.

23 Bruch, C., Michael, L. & Deandrea, C. (2017). *Political economy analysis*. Environmental Law Institute. Washington. pp 32-36.

24 Chambers, R. (1994). *Paradigm shifts and the practice of participatory research and development*. IDS working paper no. 2. Brighton. p.1.

25 CCODE (2021). *CCODE 2021-2026 strategic plan*. Center for Community Organisation and Development. Lilongwe. p. 9

26 Chinsinga, B. (2015). *Political economy analysis of urban governance and management in Malawi*. Zomba. p.7.

27 Sarker, M.A. (2019). *Bangladesh Delta Plan (BDP) 2100*. Powerpoint Presentation. General Economics Division Bangladesh Planning Commission.

28 Hossain, B., Ryakitimbo, C.M. & Sohel, M.S. (2020). Climate change induced human displacement in Bangladesh: a case study of flood in 2017 in Char in Gaibandha District. *Asian Res J Arts Social Sci*. 10(1):47–60.

29 National Char Alliance (2018). *Char Development and Institutional Structure at the national Parliament*.

30 Sarker, M.N.I., Wu, M., Alam, G.M.M., & Shouse, R.C. (2020). Life in riverine islands in Bangladesh: local adaptation strategies of climate vulnerable riverine island dwellers for livelihood resilience. *Land Use Policy*. 94:104574.

31 Rahman, S. & Gain, A. (2020). Adaptation to river bank erosion induced displacement in Koyra Upazila of Bangladesh. *Progress in Disaster Science*.

32 Anon (2017). *End-line Evaluation of Community Initiated Disaster Risk Reduction (CIDRR). Final project report completed by the Institute of Disaster Management and Vulnerability Studies (IDMVS), University of Dhaka, and Friendship*. Institute of Disaster Management and Vulnerability Studies.

33 Anon (2017). *End-line Evaluation of Community Initiated Disaster Risk Reduction (CIDRR). Final project report completed by the Institute of Disaster Management and Vulnerability Studies (IDMVS), University of Dhaka, and Friendship*. Institute of Disaster Management and Vulnerability Studies.

34 World Bank (2019). *South Asia's heat rises, living standards decline*. World Bank Blogs.

35 Mishra, M. *et al* (2017). Heat wave exposure in India in current, 1.5 °C, and 2.0 °C worlds. *Environ. Res. Lett.* 12 124012.

36 World Bank (2018). Population living in slums (% of urban population).

37 Opitz-Stapleton, S. (2014). *Climate Change Impacts on Heat Stress by 2050*. Da Nang, Vietnam.

38 Azhar, G.S. et al. (2010). Heat-Related morbidity in India: Excess All-Cause Mortality Associated with the 2010 Ahmedabad Heat Wave. *PLOS One*. 2014 Mar 14;9(3):e91831.

39 NDMA (2016). *Guidelines for Preparation of Action Plan – Prevention and Management of Heat Wave*. National Disaster Management Authority.

40 NDMA (2021). Beating the Heat. See also IRADe (2021). *Review of Heat Action Plans*.

41 Hess, J. J. (2018). Building Resilience to Climate Change: Pilot Evaluation of the Impact of India's First Heat Action Plan on All-Cause Mortality. *Journal of Environment and Public Health*.

42 Govt. of Telengana (2018). *Telangana Heat Wave Action Plan*.

43 Surat Municipal Corporation (2016). *Surat Heat Action Plan*.

44 Govt. if India (2011). *Census of India, 2011*.

45 United Nations (2018). *2018 Revision of World Urbanization Prospects*.

46 Gujarat Government Gazette. (2017). *Slums of Rajkot*.

47 Ray, K., Chincholikar, J., & Mohanty, M. (2013). Analysis Of Extreme High Temperature Conditions Over Gujarat. *Mausam*, 3(64).

48 Ray, K., Chincholikar, J., & Mohanty, M. (2013). Analysis Of Extreme High Temperature Conditions Over Gujarat. *Mausam*, 3(64).

49 IRADe (2022). *Climate Adapative Heat Action Plan- Rajkot City*. Integrated Research and Action for Development.

50 IRADe (2022). *Climate Adapative Heat Action Plan- Rajkot City*. Integrated Research and Action for Development.

51 Hoegh-Guldberg, O., Jacob, D. & Taylor, M. (2018). *Impacts of 1.5°C of Global Warming on Natural and Human Systems*. Intergovernmental Panel on Climate Change.

52 IRADe (2021). *Vulnerability Assessment of Households in Rajkot to Heat Stress*.

53 Khakhariya, N. (2019). RMC to lower heat wave warnings by half a degree. *The Times of India*.

54 Sife, C. (2014). *Role of cooperatives in agricultural development and food security in Africa*. United Nations Department of Economic and Social Affairs.

55 Sife, C. (2014). *Role of cooperatives in agricultural development and food security in Africa*. United Nations Department of Economic and Social Affairs.

56 EOS Data Analytics (2022). *Agricultural Cooperatives: Specifics, Role, Pros & Cons*

57 Wanyama, Fredrick. (2014). *Cooperatives and the Sustainable Development Goals: A Contribution to the Post-2015 Development Agenda*. International Labour Organization (ILO).

58 Kurukulasuriya, P. & Rosenthal, S. (2003). *Climate change and agriculture: A review of impacts and adaptations*. World Bank.

59 Adrien, C. (2014). *Threatened by climate change, coffee growers look to the wild for solutions*.

60 Perfecto, I., Rice, R., Greenberg, R., & Van der Voort, M (1996). Shade Coffee: A Disappearing Refuge for Biodiversity. *Bioscience*. 46.

61 Cerda, R., Avelino, J., Gary, C., et al. (2017). Primary and Secondary Yield Losses Caused by Pests and Diseases: Assessment and Modeling in Coffee. *PLoS ONE*. 12.

62   Brugere, C., Msuya, F.E., Jiddawi, N., et al. (2019). *The introduction of an improved seaweed farming technology for women's empowerment, livelihoods and environmental protection*. Institute of Marine Sciences, Zanzibar.

63   FAO. (2018). *The global status of seaweed production, trade and utilization*. Globefish Research Programme Volume 124, 120.

64   Msuya, F. E. (2012). *A study of working conditions in the Zanzibar seaweed farming industry*.

65   Msafiri, D (2021). *Enhancing Competitiveness of Seaweed Industry in Zanzibar*. Repoa Brief 12/2021

66   Msuya F.E. (2006). *The Seaweed Cluster Initiative in Zanzibar*, Tanzania. In Mwamila B.L.M. & A.K. Temu, Proceedings of the 3rd Regional Conference on Innovation Systems and Innovative Clusters in Africa, Dar es Salaam, Tanzania, September 3-7, 2006. pp 246-260.

67   Zanzibar Seaweed Cluster Initiative

68   Msuya F.E. (2006). *The Seaweed Cluster Initiative in Zanzibar*, Tanzania. In Mwamila B.L.M. & A.K. Temu, Proceedings of the 3rd Regional Conference on Innovation Systems and Innovative Clusters in Africa, Dar es Salaam, Tanzania, September 3-7, 2006. pp 246-260.

69   Lovett, P. & Phillips, L.D. (2018). *Agroforestry Shea Parklands of Sub-Saharan Africa: Threats and Solutions*. Technical Report. The World Bank.

70   Farming Portal (2022). *Shea Trees of Africa*

71   Prosper Africa (2021). *Africa's Shea Industry Delivers Returns and Impact – an Interview with Eu'Genia Shea*

72   Farming Portal (2022). *Shea Trees of Africa*.

73   USAID (2016). *Global Shea Alliance Fact Sheet*.

74   Venturini, S., et al. *Cultivating Climate Resilience: The Shea Value Chain*

75   Action for Shea

76   Action for Shea

77   Crow, M.M. & Dabars, W.B. (2020). *The fifth wave: The evolution of American higher education*. Baltimore: Johns Hopkins University Press.

78   Chase, G. & Rowland, P. (2004). The Ponderosa Project: Infusing sustainability across the curriculum. In P.F. Barlett & G. Chase (Eds.), *Sustainability on campus: Stories and strategies for change* (pp. 91-106). Cambridge, MA: The MIT Press. See also Swaniker, F. (2018). "We need to completely reimagine education". *Blog on Learning Development*.

79   Warlick, D. (2012). Becoming future-ready. *2¢ Worth*.

80   Brownell, J.E. & Swaner, L.E. (2010). *Five high-impact practices*. Washington, DC: AAC&U. See also Kuh, G. (2008). *High-impact educational practices: What they are, who has access to them, and why they matter*. Washington, DC: Association of American Colleges and Universities.

81   Kuh, G. (2008). *High-impact educational practices: What they are, who has access to them, and why they matter*. Washington, DC: Association of American Colleges and Universities.

82   Alexander, F.K. & Pushnik, J.C. (2017). Public-public partnerships for a new paradigm in the civic role of the university. *Sustainability: The Journal of Record, 10(5)*, 315-321; Barlow, J.A. (2018). The Sage Project: Community Engagement for Sustainable Cities. *Experience Magazine: Practice and Theory, 2*, 97-117; Schlossberg, M., et al. (2018). Educational Partnerships for Innovation in Communities (EPIC): Harnessing university resources to create change. In A.I. Frank & C. Silver (Eds.), *Urban planning education: Beginnings, global movement and future prospects* (pp. 251-268). Cham: Springer International Publishing; Schlossberg, M. (2018). Opportunities and challenges of university-community partnerships: Lessons from the EPIC Model. In Technion (Ed.), *Between commitment and engagement: Social activism in architecture and town planning professional training*. Haifa: Technion Press.

83   Schlossberg, M., et al. (2018). Educational Partnerships for Innovation in Communities (EPIC): Harnessing university resources to create change. In A.I. Frank & C. Silver (Eds.), *Urban planning education: Beginnings, global movement and future prospects* (pp. 251-268). Cham: Springer International Publishing.

84   Larsen, D.R., et al. (n.d.). *The City of Monona receives on-the-ground support to work toward a more sustainable, livable future*. EPIC Network.

85   Schlossberg, M., et al. (2018). Educational Partnerships for Innovation in Communities (EPIC): Harnessing university resources to create change. In A.I. Frank & C. Silver (Eds.), *Urban planning education: Beginnings, global movement and future prospects* (pp. 251-268). Cham: Springer International Publishing; Schlossberg, M. (2018). Opportunities and challenges of university-community partnerships: Lessons from the EPIC Model. In Technion (Ed.), *Between commitment and engagement: Social activism in architecture and town planning professional training*. Haifa: Technion Press.

86   Schlossberg, M., et al. (2018). Educational Partnerships for Innovation in Communities (EPIC): Harnessing university resources

to create change. In A.I. Frank & C. Silver (Eds.), *Urban planning education: Beginnings, global movement and future prospects* (pp. 251-268). Cham: Springer International Publishing; Schlossberg, M. (2018). Opportunities and challenges of university-community partnerships: Lessons from the EPIC Model. In Technion (Ed.), *Between commitment and engagement: Social activism in architecture and town planning professional training*. Haifa: Technion Press.

87   Carlson, S. (2013). 10-week think tanks. *The Chronicle of Higher Education*.

88   Burnham, M. (2010). In Oregon, students seek key to a sustainable city. *The New York Times*.

89   Carlson, S. (2013). Oregon's homegrown export, customized by locale. *The Chronicle of Higher Education*.

90   Global Adaptation Network. (n.d.). Students discover solutions to help Durban slums adapt to climate change. UN Environment Programme.

91   Johnson, B., Culver, T., & Hauschild, J. (2014). *Rosemount Climate Action Plan*. University of Minnesota Resilient Communities Project.

92   Anderson, N., et al. (2014). *Rosemount Greenhouse Gas Reduction Plan*. University of Minnesota Resilient Communities Project.

93   Nira, R. (2017). Students, residents in Houston neighborhood to create plan combating polluted conditions. *archone: e-news from the College of Architecture*.

94   KRIS 6 News (2019). Texas A&M System helps Rockport recover after Hurricane Harvey; Carney, S. (n.d.). *In the shadow of the storm: Rebuilding Rockport*. Texas Sea Grant.

95   Global Adaptation Network. (n.d.). *Students discover solutions to help Durban slums adapt to climate change*. UN Environment Programme.

96   Global Adaptation Network. (n.d.). *Students discover solutions to help Durban slums adapt to climate change*. UN Environment Programme.

97   Global Adaptation Network. (n.d.). *Students discover solutions to help Durban slums adapt to climate change*. UN Environment Programme.

98   EPIC Network (2002). *Empowering community income diversification through sustainable smart farming by academia resources*.

99   Zulkifli, C.Z. (2022). *Hands on training: Technology in agriculture*. EPIC Network; Zulkifli, C.Z. (2022). *Sustainable community urban farming workshop - online*. EPIC Network.

100   Bejrananda, N. (2022). *Public green space GIS in Hat Yai Municipality*. EPIC Network.

101   Barlow, J.A. (2018). The Sage Project: Community Engagement for Sustainable Cities. *Experience Magazine: Practice and Theory, 2*, 97-117.

102   Anon (2015). Municipio lanza programa "Comuniparques". *San Diego Red*; Esterbrooks, J. (2016). Sage Project heads south of the border. *SDSU NewsCenter*.

103   Hicks, B., et al. (2016). *Greening Tijuana's parks: Sustainable design solutions*. The Sage Project at San Diego State University.

104   de Marco, J. (2021). *Solar Schools Project*. EPIC Network.

105   LEDS Lab. (2020). *Município de Belo Horizonte: Relatório de insumos técnicos e modelos de financiamento para a preparação de projetos de eficiência energétic e geração distribuída*. ICLEI.

106   Warlick, D. (2012). Becoming future-ready. *2¢ Worth*.

107   SCF (2020). *Fourth (2020) Biennial Assessment and Overview of Climate Finance Flows*. UN Framework Convention on Climate Change, Bonn. §304

108   Adaptation Committee (2021). *Approaches to reviewing the overall progress made in achieving the global goal on adaptation*. UN Framework Convention on Climate Change, Bonn. p.2, §3

109   Adaptation Fund (2020). *Climate Adaptation Finance: Direct Access*.

110   The Adaptation Fund (2017). *Adaptation Story South Africa*.

111   Soal, S., and Merrill, T., 2021. Adaptive Management: Enhancing direct access to climate finance. Case Study 2. Small Grants Facility project. SouthSouthNorth.

112   Adaptation Fund (2022). *Report of the Thirty Seventh Meeting of the Adaptation Fund Board*. Decision B.37/1.

113   Adaptation Fund (2022). *Lessons learned: Adaptation Fund's streamlined accreditation process*.

114   Adaptation Fund (2022). *Lessons learned: Adaptation Fund's streamlined accreditation process*.

115   Dhruba, G.C. & Bhandari, J. (2010). *Carbon Sequestration Potential and Uses of Dendrocalamus srictus*. IUFRO World Series Vol. 27. 27. 62-66.

116   Ghose, B., Dhawan, H., Kulkarni, H., et al. (2018). Peoples' participation for sustainable groundwater management. *Clean and Sustainable Groundwater in India*, pp215-234. Springer, Singapore.