



# Resilience in Action: Lessons from Public-Private Collaborations Around the World

## Case Studies

**C**ommunities, businesses, governments and civil society organisations around the world have begun to feel the impacts of climate change. Along with sustained efforts to mitigate climate change’s disastrous effects, these players are increasingly taking actions to reduce their vulnerabilities and exposure through disaster risk management (DRM) and climate change adaptation activities which together help strengthen resilience (referred to in the case studies as “resilience-building activities”).



Effectively building resilience requires participation from all members of society. Public officials are increasingly looking to partner with the private sector in order to rapidly deliver the solutions needed today. **Public-private collaborations (PPCs)**—which include both formal and informal partnerships and initiatives—can result in DRM and adaptation activities that draw from the expertise and resources of both governments and businesses to create resilient economies and communities.

**The following case studies demonstrate how innovative collaborations, both formal and informal, with the private sector can make communities, economies, and businesses more resilient to current threats and future impacts.** The case studies were prepared in connection with the report *Resilience in Action: Lessons from Public-Private Collaborations around the World*, which analyses them in greater detail, drawing out opportunities, barriers, success factors, and lessons learned for policy-makers and decision-makers seeking to promote collaboration on climate adaptation and disaster risk management.

# Case Study Format

Nine projects and programmes are presented in this report in the form of 2-page case studies. These include:

1. Deutsche Post DHL: Getting Airports Ready for Disaster
2. AfricaFertilizer.Org: Using IT to Share Fertiliser Market Intelligence
3. Clean Drinking Water Distribution through Water Kiosks
4. Building Resilient Communities through Multi-Sectoral Partnerships
5. Creating Supply Chain Partnerships to Safeguard Smallholder Livelihoods
6. Mwanza Rural Housing Programme: Building Flood Resilience in Tanzania
7. PepsiCo: Direct Seeding Methods in Indian Rice Paddies
8. Micro-Hydropower for Community-Based Rural Electrification in Sri Lanka
9. Building a Sustainable Biomass Business while Combating Desertification in China

Each case study includes the following sections:

- Summary
- Key messages
- Icons indicating type of resilience-building activity and activity sectors (see Box 1)
- Introduction
- Project Activities
- Project Partners
- Project Structure Diagram
- Outcomes and Impacts
- Lessons Learned

## Box 1 — Guide to case study icons

Icons are used to indicate three aspects of the project's purpose and focus: the type of resilience-building activity (climate adaptation, disaster risk management, etc.), the economic sector (agriculture, energy, etc.), and the social sector (public, private, civil society).

### Type of Resilience Activity



Disaster Risk Man-  
Climate Change  
Alternative & Resilient

### Economic/Activity Sector



Transportation & Logis-  
Energy  
Waste  
Tourism

### Social Sector



Private Sector  
Public Sector  
Civil Society



Water  
Financial Services  
Housing  
Information & Communication Technology



Health  
Agriculture  
Fishing / Aquaculture



# 1. Deutsche Post DHL: Getting Airports Ready for Disaster

Deutsche Post DHL (DPDHL) has provided “Get Airports Ready for Disaster (GARD)” trainings in Nepal, Bangladesh, Indonesia, Lebanon, Turkey, and El Salvador since 2010. This programme has successfully prepared over 150 airport personnel to manage the logistical challenges posed during and immediately following natural disasters. Deutsche Post developed the GARD programme in close cooperation with United Nations Development Programme (UNDP), leveraging the company’s expertise in logistics to address a significant disaster risk management issue.



Transport & Logistics



Disaster Risk Management

## Key Messages:

- **Trainings make lasting impacts when they are designed to overcome institutional inertia and provide continuity throughout staff turnover.** GARD enables this by working to embed training principles in public policy and airport procedures.
- **GARD’s model has global applicability as airports around the world seek to prepare for increasingly severe disasters.** Not only can GARD be easily replicated, but the model of publicly-facilitated, private sector-led training programmes can also be applied to other preparedness issues.

## Introduction

When extreme disasters occur, the surge in traffic at local airports is often overwhelming and can delay or disrupt the transport of humanitarian relief supplies. In countries vulnerable to major natural disasters, it is important to prepare communities and infrastructure before a major disaster strikes so that they can respond effectively and efficiently.

## Project Activities

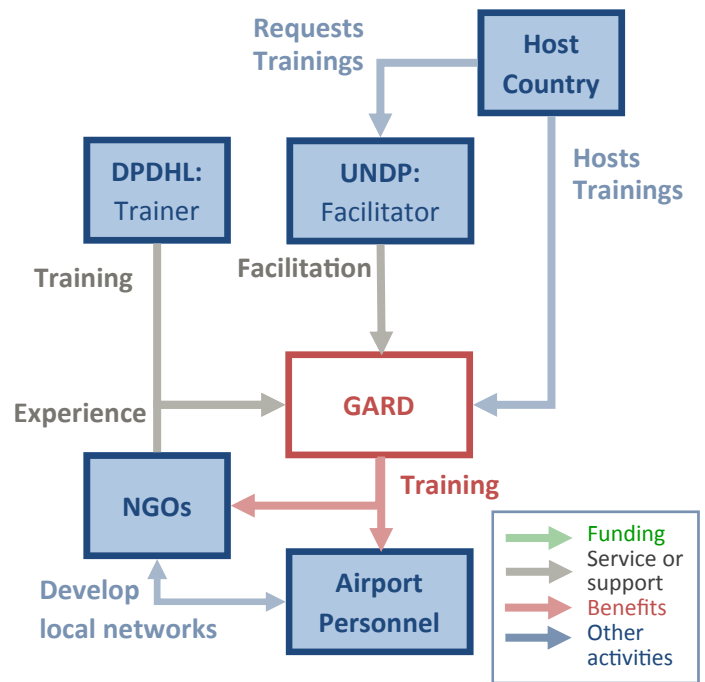
The GARD programme is implemented through a collaboration between Deutsche Post DHL (DPDHL), United Nations Development Programme (UNDP), United Nations World Food Programme (WFP), the International Committee of the Red Cross (ICRC), and local governments. The mail and logistics company DPDHL co-developed the programme with a long-term partnership with UNDP. DPDHL serves as a consultant and trainer, providing materials, lectures, and consultation for GARD trainings, while UNDP coordinates with government officials to organise the trainings. A country can participate in GARD’s training through an official country

request issued to UNDP at no cost, as UNDP and DPDHL employees donate their time and knowledge for the GARD programme. Participating countries are responsible for hosting trainings; implementing follow-up activities; and managing and updating the airport assessment report, which is one of the workshop outcomes. Although trainings primarily target airport personnel, government officials, representatives from disaster management agencies and non-profit humanitarian organisations frequently participate as well, including organisations such as WFP and the ICRC. In addition to benefitting from the shared information, these agencies also enhance the conversation by offering valuable insights and expert networks from their experience in disaster relief management.

The GARD programme, now in its 4th year, has provided trainings at 14 airports in 6 countries. Because the trainings often draw personnel from multiple airports in the region, these trainings have reached over 150 airport personnel representing more than 36 airports. The first GARD training was held in Nepal in 2010. It included 24 airport employees and provided an opportunity to

## Project Partners & Structure

-  **DEUTSCHE POST DHL** | Shares technical expertise in logistics, allocates logistic experts and aviator trainers as well as the workshop materials.
-  **UNDP** | Organises and facilitates trainings by aligning relevant authorities and leveraging its in-country network and expertise.
-  **UN WFP** | Participates in trainings and enhances the conversation by offering insights.
-  **THE INTERNATIONAL COMMITTEE OF THE RED CROSS (ICRC)** | Participates in trainings and provides a professional networking ground for disaster response experts at a country level.
-  **Host country governments** | Requests training and follow-ups and hosts training activities.



evaluate five different Nepalese airports' disaster preparedness. In 2011, the programme was expanded to Bangladesh and Indonesia where 4 GARD trainings included representatives from 19 airports. In 2012, an international airport in Beirut, Lebanon, and another in Istanbul, Turkey held GARD trainings with a wide range of participants from multiple airports. In 2013, a GARD workshop was held in El Salvador for the first time, with more trainings planned for the Philippines and Armenia. These 4-5 day trainings are held at the airports to allow on-site fieldwork and include in-class instruction as well as assessment work. Participants are taught how to evaluate their airport storage options for relief goods and to assess whether the necessary equipment (e.g. forklifts, pallets, gloves, and boxes) is available for cargo handling. An outcome of GARD trainings is the development of an Airport Surge Capacity Assessment Report, a tool used to analyse an airport's capacity to deal with a sudden inflow of disaster relief goods and services.

### Outcomes and Impacts

Over 150 airport employees in 5 countries and numerous representatives from government agencies and disaster relief organisations have received GARD trainings since the inception of the programme in 2010. The approaches taught through GARD have had implications beyond facility-level preparedness: for example, GARD methodology is now standard practice for annual airport-security trainings and disaster risk management plans at Bangladeshi airports. In addition, the Nepali government

has made the GARD's Airport Surge Capacity Assessment method a part of its National Disaster Preparedness Plan. Through its follow-up programme, GARD Plus, participating countries can hold a follow up training one year after the initial training, an option which includes repetition and application of the entire training content.

### Lessons Learned

- **Leveraging core competencies can result in mutual benefits for partners involved and long-term partnerships.** The GARD Programme has been successful because it leverages the unique knowledge and experiences of its partners in clearly defined roles. DPDHL's experiences in logistics and mail business enable UNDP to offer a training that can have a stronger impact on the preparedness for airports and government officials.
- **Follow-up training is important for preparedness.** GARD seeks to foster an on-going airport preparedness training by developing assessments reports and making participating countries or airports responsible for managing the living documents. Additionally, GARD has standardised its approach, making it possible for past participants to support wider knowledge development for airports personnel and government officials. GARD Plus helps ensure long-term sustainability of institutional knowledge by repeating the training contents and exercises, increasing the chances that the principles will be integrated in policies and practices.





## 2. AfricaFertilizer.Org: Using IT to Share Fertiliser Market Intelligence

Sub-Saharan Africa faces the combined challenges of declining soil health and crop yields, rising demand for key staples, persistent malnourishment, and poor access to affordable agricultural inputs, all of which could be exacerbated by climate change. AfricaFertilizer.Org (AFO) was started in 2010 to help address the challenges of food insecurity and climate change by increasing farmers' access to fertiliser markets and policy information. AFO utilises the internet, social media and mobile applications to facilitate the development of the nascent fertiliser market in Sub-Saharan Africa by providing fertiliser statistics, policy information, market news, product catalogues, and business directories to agro-dealers and farmers.



ICT



Climate Change  
Adaptation



Agriculture

### Introduction

Sub-Saharan Africa faces significant challenges including deteriorating soil health, falling crop yields, limited access to agricultural inputs, rising demand for key staples, and persistent malnourishment. Aggravating the challenges of providing for a growing population is the fact that soil health in Sub-Saharan Africa has been steadily declining. An estimated US\$4 billion worth of soil nutrients is lost each year due to over-use and repeated planting without recharging the soil.

Climate change threatens to add to these challenges, with regional warming projected to be greater than the global average and average rainfall projected to fall. As a result, key export crops are projected to decrease by 2050. Addressing these challenges requires an “all-of-the-above” solution that increases resilience through sustainable farming but also leverages the capabilities offered by modern agricultural methods.

Sub-Saharan Africa currently has the world's lowest use of fertiliser at approximately 10-12 kg per hectare per

### Key Messages:

- Creatively leverage the African ICT revolution.** AfricaFertilizer.Org uses SMS to both collect and disseminate information from farmers and agro-dealers, helping reach the approximately 475 million people now using cellphones in Sub-Saharan Africa.
- Participating in public-private collaborations (PPCs) can be a cost-effective way for private sector partners to gain market intelligence in emerging markets.** Collaborating with domestic and research organisations can facilitate knowledge exchange that provides mutual benefits. In this case, the International Fertilizer Industry Association provided data but is also positioned to gain knowledge about African markets that would not be cost-effective if done independently.

year. This is due in part to the high cost of fertiliser in rural regions, with prices often reaching two to four times the global average.

### Project Activities

The AfricaFertilizer.Org (AFO) project was started in 2010 to foster the growth of the fertiliser industry in Sub-Saharan Africa by facilitating information sharing at all levels of the value chain. Access to reliable data is a fundamental prerequisite for the development of any modern market. However, many of the institutions and information channels are still taking shape in many parts of the region. AFO works to address gaps in knowledge by connecting a wide range of partners and facilitating information exchanges through web and mobile platforms.

In particular, AFO sources, aggregates, filters, and shares Africa-based fertiliser statistics and fertiliser intelligence among farmers and agricultural industry specialists. This includes (1) aggregating official statistics and private

## Project Partners & Structure



**FAOSTAT** | Statistics division of the FAO. Provides access to its database and offers consortium management and technical assistance to improve data sharing.



**IFDC** | Public international fertiliser advocacy organisation that provides financial assistance and project management.



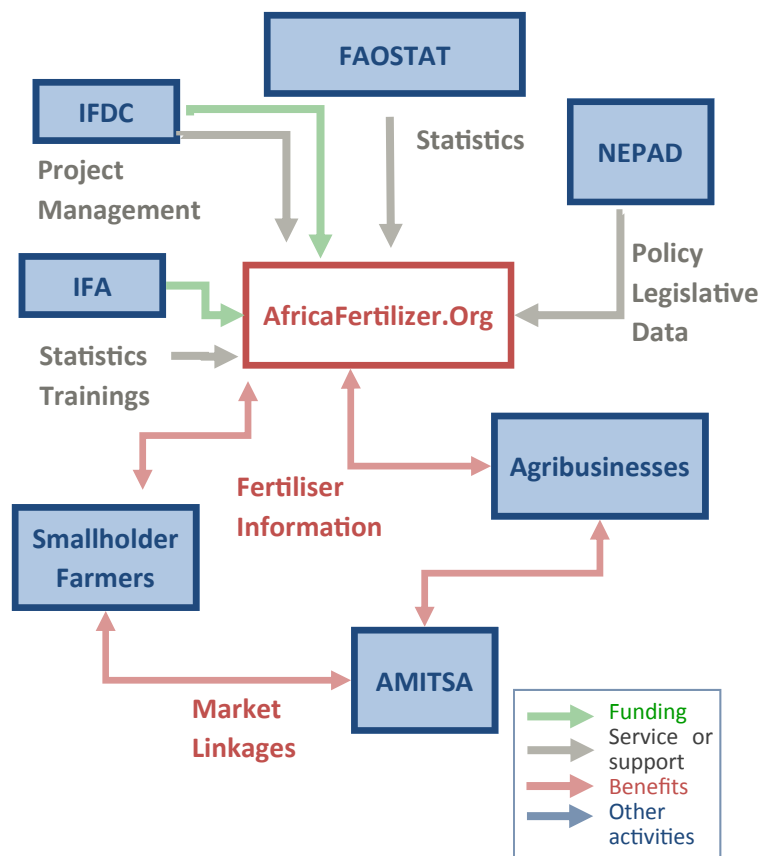
**NEPAD** | African Union initiative that provides policy and legislative data and advocates among policymakers to improve access to fertiliser.



**IFA** | Global not-for-profit that represents the fertiliser industry and provides financial support, access to fertiliser statistic database and trainings for statisticians in data collection and processing methods.



**AMITSA** | Multi-sectoral collaboration that provides access to market intelligence and up-to-date price data.



sector data; (2) surveying production and storage capacities; (3) building a network of agro-dealers who can provide real-time market intelligence using mobile platforms; (4) providing information on proper fertiliser use through trainings, conferences, and mobile platforms; (5) training statisticians to improve the development of reliable data; and (6) building a “yellow pages” of fertiliser producers and dealers.

The project structure is complex and involves collaborations not only between individual organisations but also other regional entities. The partner organisations are the International Fertilizer Development Centre (IFDC), the International Fertilizer Industry Association (IFA), the Food and Agriculture Organization’s Statistics Division (FAOSTAT), and the Regional Agricultural Input Market Information and Transparency System (AMITSA). All partners contribute to one or more of the following key inputs: funding, information, administration, training or platforms for gathering or disseminating information.

### Outcomes and Impacts

By engaging the publishers of major international databases such as FAOSTAT and IFADATA, AFO has helped extend access to data, reaching an estimated 10,000 agro-dealers and millions of farmers across Eastern and Western Africa. Because AFO’s resources contribute to

overall market development, its impact is indirect and hence difficult to measure. However, fertiliser use in Sub-Saharan Africa is growing, having increased from 8 kg per hectare per year in 2004 to 10-12 kg per hectare per year in 2010.

### Lessons Learned

- **PPCs can take a multi-pronged approach to address near- and long-term food supply needs.** The AFO project successfully leverages partnership strengths and skills to achieve cost-savings and improve fertiliser use. Through its multiple stakeholder approach, the AFO project is able to fill gaps in knowledge specific to Sub-Saharan Africa and provide valuable data and market intelligence to other partnership members. The project strengthens the local capacity of statisticians and research institutions to collect and process data by offering specialised trainings to statisticians.
- **The private sector may invest in PPCs with an eye toward more distant benefits.** Currently, Sub-Saharan Africa only represents 1.5 per cent of the world fertiliser market and production in the region is very limited. However, IFA’s involvement is driven in part by a recognition of the long-term benefits of growing the market while acknowledging that its investment will not yield any near-term payoff in the traditional sense.



### 3. Clean Drinking Water Distribution through Water Kiosks

Many people in Zambia lack access to safe and reliable sources of drinking water. Without a central water supply, many residents rely on natural river streams, which can be infected with diseases. It is anticipated that droughts, floods, extreme heat, and a shorter rainy season will increase the spread of water-borne diseases and reduce the availability and quality of drinking water. The Zambian “Devolution Trust Fund” (DTF) Water Kiosk project works with commercial water utilities and village-level entrepreneurs to create decentralised water kiosks throughout Zambia.



#### Key Messages:

- The water kiosk model facilitates entrepreneurship by eliminating major upfront investment costs to launching a retail micro-enterprise.
- The water kiosk model extends many of the benefits of water infrastructure while avoiding the barriers of high capital costs. While it does not offer a level of service equivalent to that of conventional water infrastructure, water kiosks provide other benefits such as long-term job creation and entrepreneurial opportunities.

#### Introduction

In Zambia, over 2.85 million residents in low-income areas lack access to safe and reliable sources of drinking water. The centralised water and sanitation network often cannot be extended to low-income areas due to high-density housing and concerns around cost recovery, forcing residents to rely on natural river streams or expensive and unregulated private providers for water. These sources can be infected with diseases such as cholera and roundworm. Climate change is expected to further exacerbate this problem by reducing the country’s already scarce access to potable water.

Decentralised water kiosks can help provide a safe, local water supply at affordable prices. The decentralised kiosk network is owned, maintained, and regulated by commercial utilities, while the day-to-day sales operations of the kiosks are managed by village-level entrepreneurs. In this way, villages gain access to safe, reliable, and affordable sources of water while receiving valuable training in business operations that promote community and economic development.

#### Project Activities

The Zambian “Devolution Trust Fund” (DTF) Water Kiosk project manages health and disaster risks by addressing the growing need for access to safe drinking water through a decentralised approach. Funded by the German government-owned development bank Kreditanstalt für Wiederaufbau (KfW), the project works with commercial water utilities to create decentralised water kiosks throughout Zambia. The commercial utility is responsible for the construction and maintenance of the water kiosks, and maintains ownership of the physical assets. However, the daily sales operations are carried out by small, entrepreneurial businesses that earn a 30 to 40 per cent commission on the sale of water, which is sold at the national, regulated price. Because a single kiosk can serve 500-1500 people, this commission can become a significant source of income. Kiosk operators generate additional income by selling other household items ranging from condoms and cigarettes to flour and sugar.

## Project Partners & Structure



**COMMERCIAL UTILITY** | Responsible for construction and maintenance of kiosks. Kiosks construction requests are submitted through the DTF procurement portal.



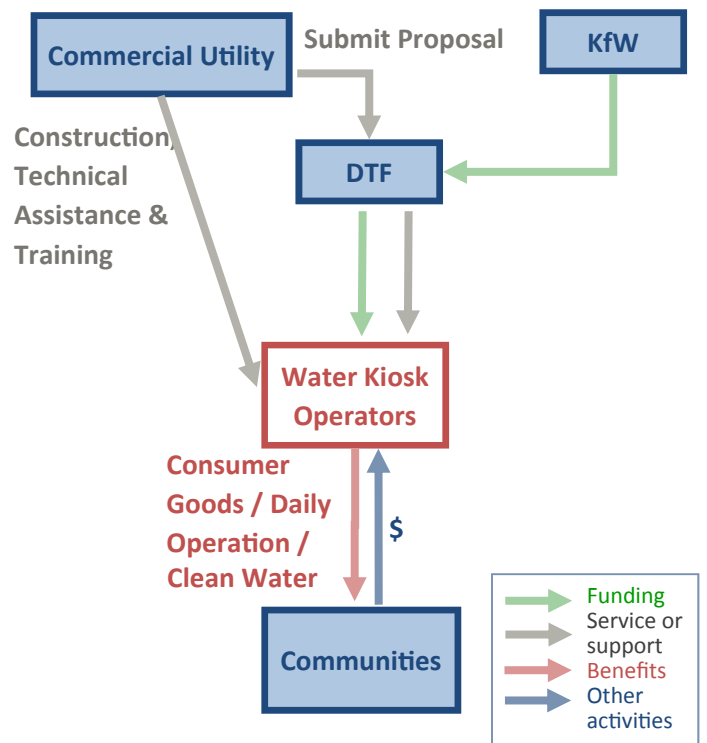
**WATER KIOSK OPERATORS** | Local entrepreneurs who receive training in kiosk operation and management. Responsible for daily business operations and marketing.



**DEVOLUTION TRUST FUND (DTF)** | Fund established by the Zambian National Water Supply and Sanitation Council, which is responsible for the water kiosk public procurement process. Provides financing and technical assistance to successful bidders, as well as monitoring and evaluation.



**KfW** | German international development bank that provided funding.



### Outcomes and Impacts

Since the project began in 2008, more than 500,000 people have been provided with access to safe and affordable water distributed through more than 300 water kiosks. A notable indication of success is that more than 70 per cent of households in a low-income area will use a water kiosk when one is available.

In selecting kiosk operators, DTF gave special attention to creating opportunities for women's economic participation in the formal sector. As a result, approximately 50 per cent of kiosk operators are women. This involvement creates potential opportunities for important information dissemination, as water collection is typically a female household task.

The project has not only provided residents with access to safe and affordable water, but has also catalysed valuable improvement in business development, women's economic security, and resilient community economic development.

### Lessons Learned

- ***This innovative business model has been successful in rewarding entrepreneurs.*** A factor of success is the innovative business model employed by the water kiosks project. Central to an entrepreneur's success is not only his or her marketing strategy for attracting customers, but also the additional

commercial activities conducted at the kiosk. To keep water affordable and close to the regulated social tariff price of water, kiosk operators sell additional items to generate income, such as standard household supplies.

- ***Strengthening the quality and supply of the water sector can yield multiple societal benefits,*** such as enabling women to participate in the formal economy, increasing productivity and wellness through clean water access, and fostering community economic development.





## 4. Building Resilient Communities through Multi-Sectoral Partnerships

The Lake Chilwa Basin Climate Change Adaptation Programme (LCBCCAP) works to enhance the resilience of rural communities around Lake Chilwa, a threatened watershed area in southern Malawi. LCBCCAP brings together a wide range of public, private, and civil society partners to support farmers and community enterprises by providing access to training, information, markets, and banking services. The improved access to markets and awareness of climate change impacts has helped promote sustainable farming techniques and build climate-resilient livelihoods in the region.



### Key Messages:

- **Provide information and build trust before rolling out technical interventions.** LCBCCAP built trust early on by engaging key community leaders, resulting in greater community participation and engagement in the programme.
- **When climate change leads to decreased yields, adding value to products can be an effective adaptation solution.** In this case, solar fish drying and improved packaging has helped community enterprise groups sell a more valuable product.

### Introduction

Climate predictions suggest that Malawi's Lake Chilwa, a wetland of international significance, could dry up completely by 2014 as the effects of climate change worsen. Already communities have seen more than 70 per cent of the lake recede during the dry season in 2012, crippling the livelihoods of local fishermen and triggering outbreaks of diseases such as cholera and bilharzia. Communities are also impacted by erratic rainfall and erosion which threaten farmers that rely heavily on rain-fed agriculture, increasing labour requirements and use of inorganic fertilisers to maintain soil productivity. The LCBCCAP has been in operation since 2010 to mitigate these climate change effects in the basin and to increase the adaptive capacity of communities around the lake.

### Project Activities

LCBCCAP has partnered with wholesalers, retailers, NGOs, and government agencies to improve the business environment of community enterprises and advance climate-resilient livelihoods.

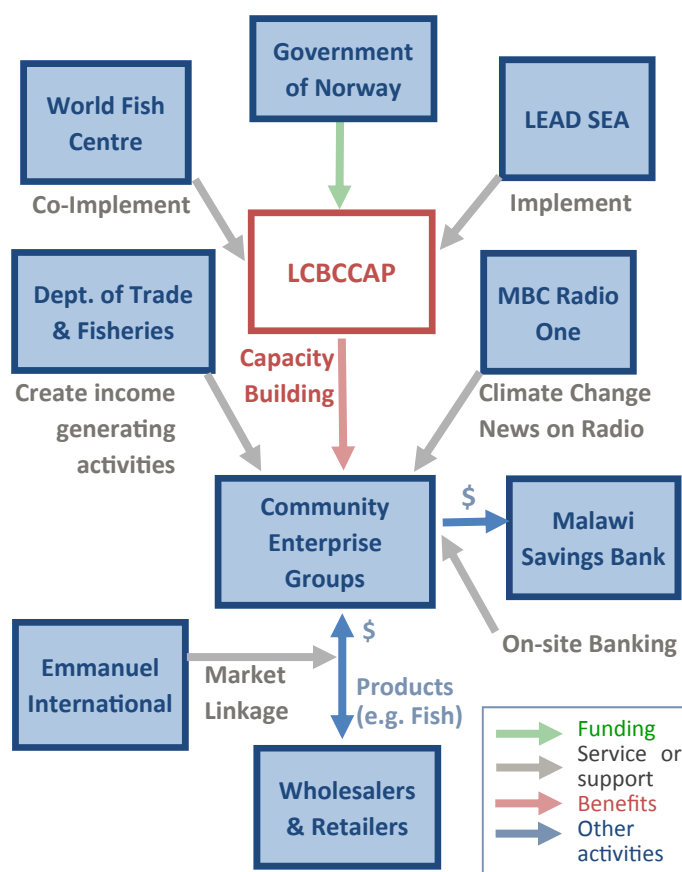
**Capacity building for micro-enterprises to add value to their products.** In 2012, LCBCCAP trained three chilli and three rice producer groups on marketing strategies and packaging techniques that can enhance their competitiveness. LCBCCAP also supported eight fish processing and trading groups by helping construct solar fish dryers which enable more sanitary and effective drying and allow the traders to market a higher value product.

**Connecting community enterprises to market.** LCBCCAP and Emmanuel International helped link community enterprise groups directly to wholesalers and retailers in order to safeguard micro-enterprises' access to market.

**On-site banking services.** Malawi Savings Bank has begun providing local on-site banking services 1-2 times weekly to allow farmers in the remote Lake Chilwa region to build a financial safety net. The Bank's service is essential for local farmers because the nearest bank branch is more than 50-75 km away, connected by poor roads with no bus transportation system. The on-site banking service was implemented in late 2012 and the initial response has been positive with significant uptake among the communities.

## Project Partners & Structure

-  **GOVERNMENT OF NORWAY** | Funded the LCBCCAP.
-  **LEAD SEA** | Malawi non-profit that implements and manages the LCBCCAP.
-  **WORLD FISH CENTRE** | Malawi non-profit that co-implements and support fish businesses in the LCBCCAP.
-  **COMMUNITY ENTERPRISE GROUPS** | Produce and sell agricultural and fisheries goods.
-  **WHOLESALE AND RETAILERS** | Purchase goods from community enterprise groups.
-  **DEPARTMENT OF TRADE AND DEPARTMENT OF FISHERIES** | Promote new income generating activities for community enterprise groups.
-  **MALAWI SAVINGS BANK** | Provides local on-site banking services for farmers.
-  **EMMANUEL INTERNATIONAL** | Canadian NGO based in Malawi that connects community enterprise groups to market.
-  **MBC RADIO 1** | Broadcasts climate change news on a radio programme.



**Climate change training and education** – The LCBCCAP has hosted numerous trainings on climate change adaptation and sustainable farming techniques targeting a wider range of community members and stakeholders, utilising radio programmes and in-person workshops.

### Outcomes and Impacts

LCBCCAP has resulted in greatly increased awareness of climate change with tangible improvements to livelihoods. A total of 53 stakeholder groups (973 people) have been trained in climate change adaptation since 2010, greatly increasing local knowledge on impacts and actions they can take to adapt. Trainings on sustainable farming techniques have also helped promote crop diversification and water conservation in the region. The livelihoods of many in the farming and fishing producer groups have improved as a result of the programme. For example, women-operated fish processing and trading micro-enterprises saw a revenue increase of 125 per cent as a result of the addition of solar fish dryers and improved packaging methods. The pigeon peas sold in bulk to the wholesaler Rab Processors have increased the revenue by 20 per cent as well. Thanks to the success of the Programme, the LCBCCAP is currently in transition to a next-phase project called the Harmonisation for Enhanced Livelihoods (HEAL) to be funded by the Government of Norway’s Development Fund.

### Lessons Learned

- **Provide information and build trust before rolling out technical interventions** – When launching the programme, LCBCCAP first held numerous training and workshops with a wide range of community members and leaders (political leaders, faith leaders, etc.). Engaging with various community members and stakeholders early on helped raise the awareness of climate change and sustainable development issues and build trust between LCBCCAP and the community.
- **Take a broad view of adaptation and addressing community needs as they arise** – Programme staff has remained attentive and flexible in the face of emerging needs and responded even to challenges not strictly within the Programme scope. For example, the LCBCCAP team responded to requests for help when Bilharzia, a disease caused by parasitic worms, emerged as an imminent threat in the region. The Programme conducted a disease prevalence survey and provided treatments to over 9,100 people through funding from the Government of Norway. Ultimately LCBCCAP recognises health, gender issues, economic stability and other sustainable development issues as intricately linked—and often necessary prerequisites—for climate change adaptation.



## 5. Creating Supply Chain Partnerships to Safeguard Smallholder Livelihoods

Coffee farmers in Rwanda are increasingly facing hardship as climate change raises average temperatures in coffee-growing regions and makes conventional cultivation methods less effective. Responding to the concerns expressed by farmers in its supply chain, Thanksgiving Coffee Company, a California-based coffee roaster, initiated the “Responding to Climate Change, Building Community-Based Resilience” partnership to implement climate-resilient farming strategies that can effectively combat future droughts, flooding, and loss of surface soils. By utilising a market-based demand-driven approach, the partnership mobilised Rwandan farmers to adopt more sustainable agriculture techniques that build resilience.



### Key Messages:

- **Smallholder farmers are increasingly aware of the opportunities to request assistance from end buyers, many of whom are increasingly focusing CSR efforts on their supply chains.**
- **Supply chain management is not only for multi-national corporations.** Small- and medium-sized companies, such as Thanksgiving Coffee, are taking leadership roles to strengthen the adaptive capacity of farmers in its supply chain.

### Introduction

Coffee farmers in Musasa, Rwanda are expected to face increasing hardship due to changes in their local climate. Coffee farms are most productive within specific temperature ranges, and warmer climates can reduce yields, alter taste, and even make certain bean varieties unsuitable. Farmers are also likely to face more extreme weather, which will cause erosion, loss of surface soils' water-holding capacity, and crop loss due to drought and flooding.

### Project Activities

Thanksgiving Coffee Company initiated the “Responding to Climate Change, Building Community-Based Resilience” programme after farmers in the Dukunde Kawa Cooperative expressed concern about altered weather patterns—such as droughts and flooding—and the potential impact on coffee yields. The project was implemented in coordination with the Cooperative and

the Rwandan Economic Development Initiative (REDI) and funded by the Dutch NGO Progreso. The project utilises a resilience-building curriculum that was designed to utilise ecosystem services through techniques such as intercropping, erosion control, and adaptive farming methods.

A unique component of the training is the use of trees and grasses to provide shade canopy, prevent soil erosion, and slow the desertification process in farms. In the beginning of the project, five tree and grass nurseries were established in order to: (1) protect topsoil by preventing erosion; (2) decrease farm temperature by developing shade canopy; (3) increase soil fertility by introducing nitrogen-fixing trees and leaf litter; and (4) reduce the risk of drought by increasing aquifer absorption. Project participants were able to purchase seedlings through the project and were taught to plant grass swales in order to control runoff, recharge aquifers, and maintain soil moisture as part of a holistic sustaina-

## Project Partners & Structure

**THANKSGIVING COFFEE COMPANY** | Facilitated stakeholder engagement sessions with cooperative members to determine farmer needs and concerns. Developed the strategic framework and programme approach. Brought in fundraising and implementation partners.

**RWANDAN ECONOMIC DEVELOPMENT INITIATIVE (REDI)** | Non-profit that provided project administration for curriculum development and farmer training at the local level.

**DUKUNDE KAWA COOPERATIVE (COFFEE FARMERS)** | Thanksgiving Coffee's long-term cooperative supplier which provided the initial ideas for the project. Collaboratively developed and implemented on-site trainings with REDI.

**PROGRESO** | DUTCH NGO that funded the project.

**USAID** | Funded and formed the Dukunde Kawa Cooperative in 2003 through the PEARL Project (Partnership to Enhance Agriculture in Rwanda through Linkages).

**THE RWANDAN GOVERNMENT** | Helped establish the Dukunde Kawa Cooperative with USAID.



ble agriculture curriculum. Farmers were then separated into 20-25 different zones to showcase best practices in teams, and winners were rewarded with cows. This demand-driven approach incentivised more active participation from farmers and has resulted in strong ownership in the project activities and outcomes.

### Outcomes and Impacts

This partnership enabled Thanksgiving Company to strengthen its supply chain by building local suppliers' adaptive capacity. From 2010 to 2011, over 89,000 trees were planted by 567 farmers in 5 different regions. This is an average of 157 trees per farmer. The planted trees have helped reduce temperature on farms, slowed fruit ripening and protected coffee blossoms from damage during heavy rains. In 2012, the project received the 2012 Sustainability Award from the Specialty Coffee Association of America (SCAA). Over the course of the project, farmers received knowledge and training in resource management, ecological restoration, and reforestation techniques that have helped protect their coffee production against climate impacts.

### Lessons Learned

- **Strong local partner participation has resulted in community ownership.** Dukunde Kawa's ability to engage directly with beneficiaries proved to be a critical component of the project's success. As a professional organisation with proven expertise in local stakeholder engagement and strong connections to the farmer community, the cooperative was quickly able to secure buy-in. Farmers provided input for innovative farming ideas that were influenced by their own experiences overcoming agricultural challenges. This active participation resulted in strong local ownership of the project participants.
- **A partnership can maximise its impact when each partner focuses on what it does the best.** This project clearly defined partner roles in order to draw from each contributor's key competency. Focusing on strengths enabled cooperative farmers to identify innovative ideas for trainings based on their own farming needs, and helped Thanksgiving Coffee fine-tune the training strategies. Additionally, the local NGO REDI leveraged its experience, trust, and communication expertise to work with local farmers as the administrator.





## 6. Mwanza Rural Housing Programme: Building Flood Resilience in Tanzania

In Tanzania, the Mwanza Rural Housing Programme (MRHP) created a brick-making programme in 1994 that would address flooding challenges in rural areas by training local villagers on how to use agricultural waste as kiln fuel for brick production. The programme has resulted in the establishment of over 60 brick-making enterprises which have collectively produced over 400 million bricks. This has saved an estimated 110,000 m<sup>3</sup> of fuel wood and increased resilience against flooding in the area's housing stock by increasing the use of a stronger building construction material.



Housing



Disaster Risk Management



Agriculture



Resilient Livelihoods

### Key Messages:

- **Public private partnerships can create markets by connecting micro-enterprises in sectors that would not ordinarily interact.** In building a more robust brick market, MRHP has created a secondary market for an agricultural waste product.
- **Training programmes require flexibility as they mature.** MRHP has successfully adapted its training programme as the needs of its entrepreneurs have evolved from creating products to managing and scaling a business.

### Introduction

The city of Mwanza, Tanzania is the country's second most populous city and is in one of the wettest regions in the country, with an annual rainfall of 700-1000 mm per year. Climate change estimates suggest that the wet season in Mwanza will become longer with a higher average monthly rainfall. Most households in Mwanza are made from poor quality mud bricks that require frequent repairs after floods and heavy rains. The surrounding environment has an abundance of clay for brick-making; however, there is a shortage of wood fuel to fire kilns due to deforestation and climate change.







### Project Activities

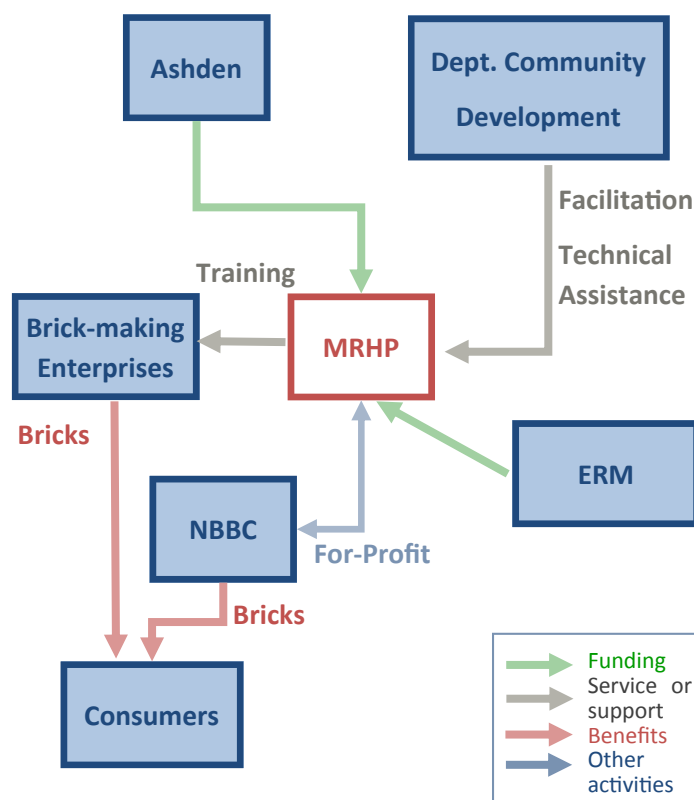
In 1994, MRHP began a training programme to teach residents of rural communities how to produce bricks using agricultural waste (such as rice husks and cotton waste) as a kiln fuel. This technique has allowed village residents to take advantage of local resources without increasing pressure on the forest ecosystem. The increased use of bricks for construction has contributed to disaster risk management by providing stronger, more resilient housing materials.

MRHP, in coordination with the Tanzanian Department of Community Development, recruits and trains villagers in manual, clay brick-making techniques. Villagers organise themselves into brick-making enterprises, where membership requirements and fees are designed on a per-enterprise basis. Frequently, members buy shares or contribute revenue to a general fund which is used to buy new tools for the enterprise or make other investments. When the initiative began, agricultural waste (rice husks) were provided free of charge. As the brick-making enterprises became more successful, farmer entrepreneurs have started new enterprises collecting and selling rice husks to brick-makers.

Initially, MRHP relied on grant funding and foreign assistance. In 2006, however, MRHP began developing the idea for a for-profit brick-making social enterprise. MRHP received US\$30,000 in special assistance from the Ashden Awards for programming and technical assistance to develop a business plan. Once the vision was completed, the ERM Foundation provided an initial loan of US\$40,000 to MRHP to establish the Nyumba Bora Brick Company (NBBC). NBBC receives orders from community members and the government for clay bricks

## Project Partners & Structure

-  **BRICK-MAKING ENTERPRISES** | Micro-enterprises trained in manual clay brick-making, which sell bricks to community and government customers.
-  **NBBC** | Social enterprise that produces clay bricks for community and government customers and provides services to members.
-  **MRHP** | Initially a government-sponsored NGO, MRHP transitioned to an independent non-profit that provides technical assistance, training, and access to capital to brick-making micro- and social-enterprises.
-  **DEPT. OF COMMUNITY DEVELOPMENT** | The Tanzanian government agency's engineering consultants advise on brick production processes and rural infrastructure and its community development officers organise trainings and assist in community outreach.
-  **ASHDEN** | Provided financial assistance and technical assistance to develop a business plan for NBBC.
-  **ERM FOUNDATION** | The CSR lending arm of the global environmental and sustainability consulting firm Environmental Resources Management (ERM). Provided start-up capital to create NBBC.



that are used to build school houses, community facilities, and housing. NBBC currently uses manual construction methods for making the clay bricks but is working to import machinery that would enable a more efficient mechanised process.

### Outcomes and Impacts

Since beginning in 1994, MRHP has established 60 brick-making enterprises that have produced over 400 million bricks—enough to build more than 150,000 homes. The MRHP programme has spread throughout Tanzania, primarily in areas where rice is already grown. The programme has been able to achieve continued success due to its competitive pricing and targeted introduction in rice-growing areas. Specifically, clay bricks made by the NBBC cost about US\$0.12 versus a machine produced, cement brick, which costs approximately US\$0.74. Not only are the clay bricks less expensive, but they are also larger than cement bricks, making them more resilient to heavy rains. By using agricultural waste as a kiln fuel, the project has saved 110,000 m<sup>3</sup> of fuel wood and avoided 75,000 tonnes of CO<sub>2</sub> emissions.

### Lessons Learned

- **Choose locations where synergistic relationships between micro-enterprises can be created.** MRHP trainings have been most successful in areas where

rice is grown. This allows clay brick-makers to reduce kiln fuel costs while creating an income-generating activity for farmers who are able to sell a waste product (husks) to the brick-making enterprises—thereby improving the livelihoods of both parties.

- **Evolve training programmes as micro-enterprises mature and new needs emerge.** Initial trainings provided farmers with skills in manual, clay brick-making. These trainings have since been adapted to include trainings targeting women-owned businesses, tree planting initiatives to provide necessary shade cover for the bricks and to combat deforestation, and business skills in market evaluation. Throughout the years, MRHP has maintained flexibility and adaptability to respond to changing environments in demand, supply, and price.
- **Access to finance remains a persistent barrier to growth.** NBBC has struggled to find consistent, reliable, and affordable access to finance in order to purchase the equipment needed to scale up its business. With high up-front investment costs and an extended payback period, long loan terms are needed but may be unappealing to traditional lenders. This emphasises the need for securing financial partners willing to provide more flexible loan terms when investing in micro-enterprises.



## 7. PepsiCo: Direct Seeding Methods in Indian Rice Paddies

Climate change predictions forecasting an increase in droughts and flooding, posing challenges for traditional, water-intensive methods of rice cultivation. In 2009, PepsiCo India launched a campaign to help farmers in rural India adapt by using PepsiCo's DirectSeeding machine. This technology was created in collaboration with the government-supported Indian Agriculture Research Institute and the Philippines-based International Rice Institute. Utilising the direct seeding method not only results in a 30 per cent reduction in water usage per acre, but also improves soil porosity and reduces methane emissions.



Agriculture



Climate  
Adaptation



Water

### Key Messages:

- **Efficient scaling through collaboration with scientific partners.** IARI and IRI are helping evaluate the effectiveness and potential of PepsiCo's DirectSeeding machine to identify how and where it can be most productive.
- **Reducing the water needs of a major food staple has global applicability.** Rice is a notoriously water intensive crop that is frequently cultivated in the world's fastest growing regions which face imminent water challenges.

### Introduction

The traditional method of rice production is water-intensive. Typically, rice seeds are cultivated in a small nursery for 4 weeks and then transplanted as paddy saplings to a main cultivation area. The main cultivation area is then flooded with 7-10 cm of water in order to prevent weeds from growing. It is estimated that this method of rice cultivation utilises 2,250 litres of water a day.

India has already begun to experience the impacts of climate change. Over the last 100 years the region has seen monsoon seasonal rainfall in major rice production areas decrease approximately 6-8 per cent. Future projections suggest increasing challenges for agricultural producers in India as the quality and quantity of available freshwater declines due to decreasing snow melt, increasing saltwater intrusion, and declining run-off in river basins.

As part of its broader corporate social responsibility commitment to use less water in its facilities and production processes, PepsiCo India developed a new,

less water-intensive technology to aid in the production of rice in 2009. The DirectSeeding Machine sows seeds uniformly at a specified gap and uniform depth and then protects seedlings from weeds through an innovative plastic crop covering. This method eliminates the need for inundation, reducing water usage by 900 kilolitres per acre and lowering the cost of cultivation by approximately US\$30 per acre. To date, the technology has been used in over 13,000 acres of rice fields.

### Project Activities

PepsiCo India developed the idea for direct seeding in 2004. Initially, manual direct seeding techniques were implemented in PepsiCo pilot farms in Jallowal, India. By 2005, the trials were extended to include more varieties of rice and local farmers were brought to the trial fields to witness the advantages of direct seeding in terms of water use, yield, and cost of production. In 2006 PepsiCo developed the DirectSeeding machine, which allowed for mechanised direct seeding and greatly reduced the amount of farmer labour required. PepsiCo's rice

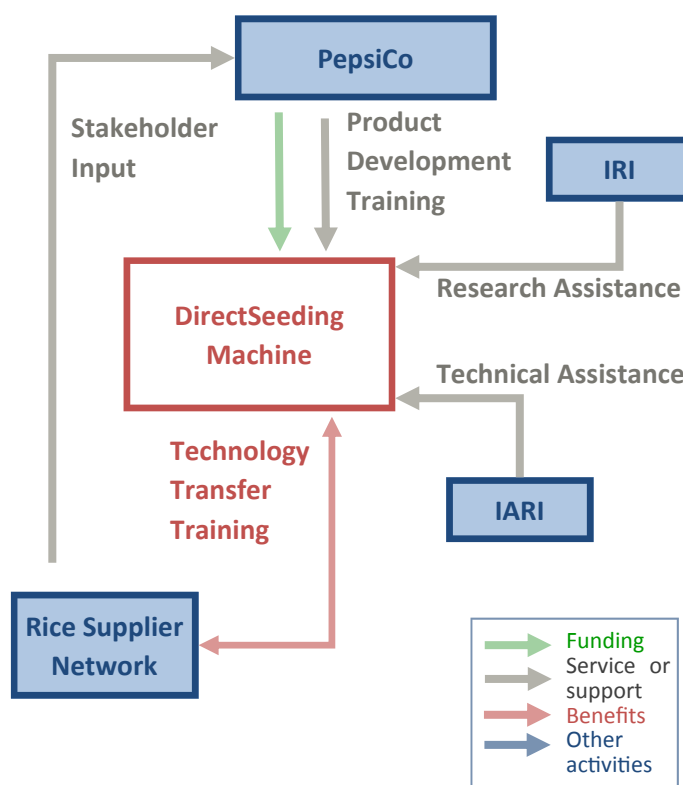
## Project Partners & Structure

**PEPSICO** | Developed the DirectSeeding Machine and funded the programme. Participated in selection of suitable rice varieties and trained farmers in direct seeding methods.

**RICE SUPPLIER NETWORK** | Individual smallholder farmers who receive free access to the DirectSeeding machine, as well as technical assistance and training in its use.

**INDIAN AGRICULTURAL RESEARCH INSTITUTE (IARI)** | Quasi-government research institution that provides research and technical assistance through monitoring, evaluation, and measuring greenhouse gas emissions and water use.

**INTERNATIONAL RICE INSTITUTE (IRI)** | Non-profit institute that has provided research assistance and technical assistance by testing the suitability of different rice varieties for optimal use with the DirectSeeding machine.



suppliers receive training in the proper use of the machine and are able to access the technology for free. The International Rice Institute (IRI) provided technical assistance by testing the suitability of different rice paddy varieties for use with the DirectSeeding Machine. In 2009, the machine was approved by PepsiCo for wider use. Its implementation and effectiveness is being monitored by the Indian Agriculture Research Institute (IARI), which is measuring the decreases in water consumption and avoided greenhouse gas emissions that have resulted from deployment of the technology.

### Outcomes and Impacts

Since beginning as a pilot in 2004, the programme has been expanded to more than 5 territories in India and the DirectSeeding machine has been adapted to include more varieties of rice. The number of participating farms has increased to over 13,000 acres, benefitting over 1,500 smallholder farmers. The direct seeding method not only saves 900 kilolitres of water per acre (compared to traditional cultivation methods), but has also reduced methane gas emissions and improved soil porosity.

### Lessons Learned

- **Education and extension contacts are pivotal.** The success of direct seeding methods depends upon proper implementation and precision management. Without proper use, direct seeding methods can be more vulnerable to weed infestation and pests. Farmers need comprehensive training in field preparation, timely operations, fertiliser use, and integrated pest management techniques in order to achieve high rice yields through direct seeding methods.





## 8. Micro-Hydropower for Community-Based Rural Electrification in Sri Lanka

In the late 1990s, almost half of the Sri Lankan population lacked access to electricity. To promote low cost community driven off-grid micro-hydro projects, the Sri Lankan Government, World Bank and Global Environment Facility (GEF) established two long-term programmes which brought various local credit institutions together to provide loan assistance and financing. The hydro systems improved access to electricity and enhanced community adaptive capacity by enabling income-generating activities. Additionally, villagers' ownership of hydro facilities led to increased protection of the upstream environment, which strengthened regional resilience against flooding.



Energy



Climate Change  
Adaptation



Resilient  
Livelihoods

### Introduction

In remote areas of the country where there is no access to grid electricity, off-grid micro-hydropower systems (5-15 kilowatts) can be used to power electric lighting (reducing the need for expensive kerosene) and other equipment that enables income-generating activities and the formation of small businesses. Being generally small in scale and community-driven, off-grid hydro projects typically have broad local support and little environmental impact. The capability to generate off-grid power is also essential for emergency communications, especially when the main grid is disrupted due to heavy rains and floods. As such, they represent a flexible energy solution that benefits the rural Sri Lankan communities and builds resilience.

### Project Activities

The UK-based NGO Intermediate Technology Development Group (ITDG) initially developed a community-driven micro-hydro model called "Village Hydro" in 1982. Now known as Practical Action, ITDG implemented the projects in Sri Lanka that were entirely villager-owned

### Key Messages:

- This innovative, replicable model of community-driven micro-hydropower system has created a multiplier effect for public-private collaborations (PPCs) in the Sri Lankan renewable energy sector. The model is still used today for new PPCs aimed at improving grid connectivity of the village hydro schemes.
- Facilitating energy access for rural communities can benefit the local economy by enabling small business development. Excess power can be used as motive power to run small machines for micro-enterprises.

and financed through cooperative structures known as Electricity Consumer Societies (ECS). In order to facilitate the financing of more micro-hydro projects, two long-term programmes were later developed with support from both the public and private sectors. With community ownership remaining as an essential characteristic of the long-term programmes, the micro-hydro projects were typically financed through three streams: 30 per cent from villagers, 50 per cent through Participating Credit Institutions (PCIs), and 20 per cent from co-financing and occasional grants from provincial councils.

- The Energy Services Delivery (ESD) programme (1997-2002), in coordination with the Sri Lankan government, the World Bank, and Global Environment Facility (GEF), funded about US\$0.8 million for off-grid micro-hydro schemes, to be disbursed as loans administered by 6 PCIs. Projects were required to be at least 5 km from the existing grid to qualify.
- The Renewable Energy for Rural Economic Development (RERED) programme (2002-2011) was funded by the World Bank's International Development Agency (IDA) and GEF. As the follow-on to ESD,

## Project Partners & Structure

**WORLD BANK, GLOBAL ENVIRONMENT FACILITY (GEF) AND THE SRI LANKAN GOVERNMENT** | Contributed initial funding for two long-term renewable energy programmes (ESD & RERED).

**THE ELECTRICITY CONSUMER SOCIETIES (ECS)** | Local community entities that owned and operated the micro-hydro facilities.

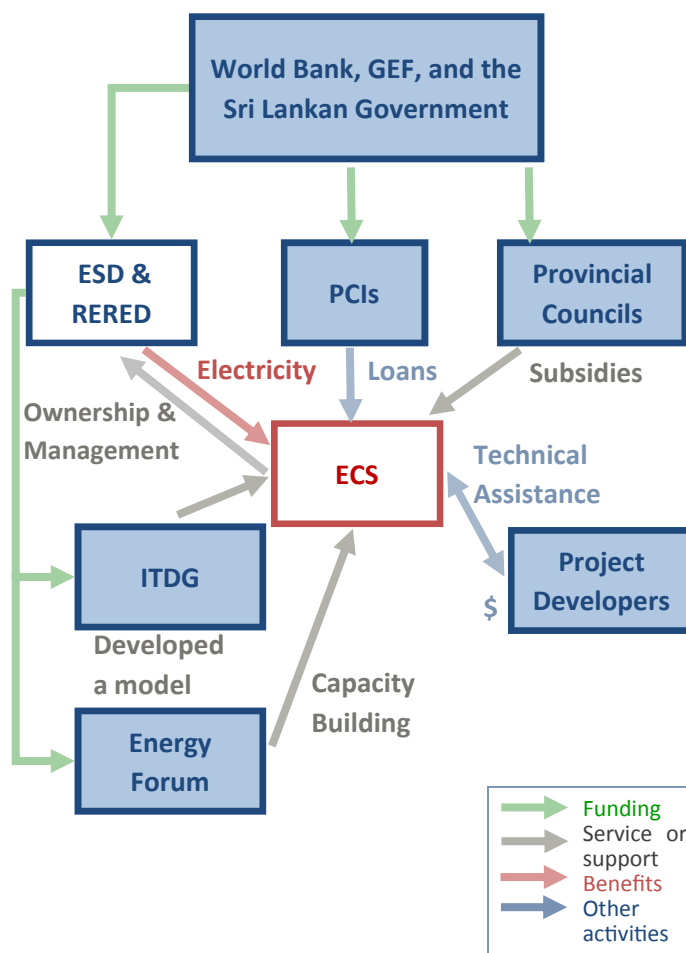
**PARTICIPATING CREDIT INSTITUTIONS (PCIs)** | Geographically distributed local credit institutions. Provided loans through ESD and RERED projects.

**PROVINCIAL COUNCILS** | Channelled direct subsidies to the village cooperatives and facilitated the subsidy approval process.

**PROJECT DEVELOPERS** | Typically contracted by the ECS to support project development and technical assistance.

**ITDG** | UK-based NGO that initially developed a community-driven micro-hydro model.

**ENERGY FORUM** | Sri Lankan NGO that supported community engagement and capacity building for project management.



RERED involved 10 PCIs who provided lending for eligible projects, and extended the programme through 2011.

Throughout the project process, Sri Lankan NGO Energy Forum conducted stakeholder meetings and feasibility tests, and hosted multiple community workshops to build capacity and raise awareness about micro-hydro power.

### Outcomes and Impacts

From 1997 to 2011, a series of successful public-private partnerships established by two long-term programmes added 2 megawatts of off-grid micro-hydro capacity, providing access to over 7,700 villagers in Sri Lanka. Apart from being able to enjoy basic electricity services, rural villagers also benefited from improved health because they no longer used kerosene. Additionally, these micro-hydro systems have improved the quality of life in rural Sri Lankan communities by enabling the villagers to engage in productive activities such as studying, and by delivering excess power to operate rice mills or establish battery charging centres. The formation of local cottage industries provided jobs for villagers in the making and selling of micro-hydropower equipment.

### Lessons Learned

- **Scaling up the ECS addressed challenges of community-driven electricity generation.** A single ECS was often taken advantage of by private project developers as it lacked necessary skills for project management and governance. Establishing the Federation of Electricity Consumer Societies (FECS), an umbrella entity composed of multiple ECS groups, empowered the ECS groups to share expertise and networks while protecting the collective ownership.
- **Partnering with a geographically distributed network of financing institutions made the implementation of projects in rural areas more effective.** In this case, easily accessible loans were available for ECS groups to build decentralised off-grid micro-hydro systems because the programme selected credit institutions from a variety of areas.
- **Long-term energy infrastructure planning promoted private sector engagement because it reduced the short-term policy risks by establishing a clear direction.** This approach has resulted in the participation of over 10 financial institutions, which have provided lending services in support of the two long-term programmes for more than 15 years.



## 9. Building a Sustainable Biomass Business while Combatting Desertification in China

The Maowusu Biomass Thermoelectric Company (MBTC) has established a business in partnership with China's State Forestry Administration to combat soil erosion and to help reduce the desertification rate. The company has planted desert shrubs, which only survive through regular pruning, and uses the trimmings for biomass power generation. This partnership has yielded multiple benefits: climate adaptation by reducing soil erosion and desertification, job creation, energy production using locally grown biomass, the creation of an additional health supplement side business, and successful demonstration of adaptive and low carbon energy production methods.



Energy



Climate Change  
Adaptation



Resilient  
Livelihoods

### Key Messages:

- This project addresses a wide range of issues with a single elegant solution.
- MBTC's business model makes replication at the necessary scale feasible. Desertification is a large-scale challenge but MBTC's model and intention to build 2,000 more biomass plants shows the potential for leveraging market-driven solutions.

### Introduction

The Maowusu Desert, located between Yulin City in central China's Shaanxi Province and Ordos City in Inner Mongolia, is one of the four largest deserts in China. Deserts in China are spreading by 3,300 km<sup>2</sup> annually due to climate change, illegal logging, and unsustainable agricultural practices. Slowing this rate will require more active prevention of soil erosion and desertification. In 2008, Maowusu Biomass Thermoelectric Company (MBTC) began planting trees and shrubs in the Maowusu Desert, providing a feedstock for biomass power while simultaneously reducing the speed of desertification.

### Project Activities

MBTC has turned an arid deserted region into vegetated land by successfully growing desert shrubs. This has not been without its challenges. Through trial and error, MBTC learned that a fundamental way to protect desert ecosystems is to perform pruning maintenance on the trees every three or four years to keep them alive. As a result of this maintenance, MBTC acquired large amounts

of trimmings, which became the key resource for biomass power generation.

Another challenge MBTC encountered was that biomass power generation was not cost-competitive compared with lower cost coal-fired power in China. To make up the cost difference and remain competitive, MBTC received subsidies from the State Forestry Administration and the National Development & Reform Commission. However, recognising that relying on subsidies was not a sustainable way of continuing the business, MBTC created an additional revenue stream by building a first-phase spirulina production facility. Spirulina is an algae-like substance that is used as a health supplement ingredient and animal feedstock. Spirulina can also be used as a concentrated food source in areas after disaster strikes due to its high nutrient density (spirulina is 65 per cent protein—the highest of any natural food—and is rich in beta-carotene, with concentrations ten times higher than carrots).

## Project Partners & Structure



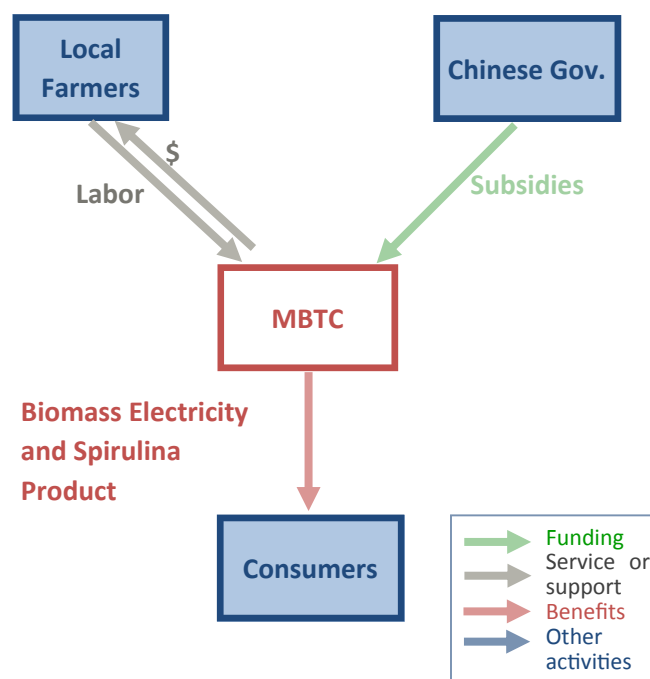
**MAOWUSU BIOMASS THERMOELECTRIC COMPANY (MBTC)** | Chinese biomass electric company that contracts local farmers to manage plants and uses the trimmings for power generation. Produces and sells an algae-like product, spirulina, which can be used as a health food supplement.



**HERDERS AND FARMERS IN THE MAOWUSU DESERT REGION** | Contracted to the MBTC, they plant shrubs in the desert, prune, and transport the trimmings to processing facilities.



**CHINA'S STATE FORESTRY ADMINISTRATION AND THE NATIONAL DEVELOPMENT & REFORM COMMISSION** | Provided MBTC with funding for research, engineering, and construction of the facilities. The government bodies also subsidised the electricity.



Since the beginning of its operation in November 2008, MBTC has invested an average of US\$7.9 million annually in regular shrub maintenance, and has developed an efficient operation process of planting, nursing, cutting, transporting and processing. The company has engaged 1,000 local farmers by contracting them to grow sand willows and has also hired 150 full-time workers at the site. With its successful business model, the company hopes to build as many as 2,000 similar power plants to turn more arid desert into vegetated fertile land.

### Outcomes and Impacts

The Maowusu Biomass Thermoelectric Company has treated over 24,000 hectares (240 km<sup>2</sup>) in the Maowusu Desert since 2008 and has a goal of treating 10,000 hectares every year. Large shrub-like plants (sand willows) have helped hold down the soil, reducing the intensity of sandstorms and making the area more hospitable to wildlife.

By creating jobs for local herdsmen and farmers, the company increased annual incomes by a total more than US\$11 million. In addition, MBTC has produced over 240 million kilowatt-hours of electricity at its 30 megawatt thermoelectric plant since 2008. The annual revenue from spirulina sales is expected to reach another US\$47.6 million (approximate), with a profit margin of 20 per cent in 2013.

### Lessons Learned

- **Adding additional revenue streams can help businesses move on a path toward financial sustainability.** MBTC found value in its shrub and carbon waste products, creating further revenue generation opportunities and enabling the company to reduce its reliance on government subsidies.
- **Local knowledge can be essential for business operations.** MBTC faced challenges reliably growing the key input to their energy production, shrubs. Drawing from the knowledge of the local community enabled MBTC to find ways to sustainably grow and care for its plants. In return, MBTC created opportunities for a range of skill sets, thereby strengthening local economic resilience.



## About MCG

Meister Consultants Group, Inc. (MCG) is an international consulting firm specialising in climate and disaster resilience, renewable energy, international dialogue, and corporate sustainability. Our services include strategy and policy development, market analysis, research programme planning and management, as well as new governance tools such as stakeholder and citizen participation, dialogue and mediation, multi-sectoral cooperation and the development and management of various multi-stakeholder initiatives.

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## About CDKN

The Climate and Development Knowledge Network (CDKN) aims to help decision-makers in developing countries design and deliver climate compatible development. We do this by providing demand-led research and technical assistance, and channelling the best available knowledge on climate change and development to support policy processes at the country level.



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