



**USAID**  
FROM THE AMERICAN PEOPLE

# IMPACT REPORT FOR THE HIGHER EDUCATION SOLUTIONS NETWORK

HIGHLIGHTS AND LESSONS LEARNED FROM FIVE YEARS OF PROGRAMS



# TABLE OF CONTENTS

<u>Introductory Letter from Ticora Jones</u> .....	5
<u>The Collaborative Design Approach</u> .....	9
<u>Research</u> .....	14
<u>Local Platforms, Local Problems, Local Partners</u> .....	20
<u>Better Evaluations Find the Right Solutions</u> .....	25
<u>Interdisciplinarity</u> .....	27
<u>Student Engagement</u> .....	32
<u>Policy Impact</u> .....	37
<u>The Development Labs</u> .....	46
<u>Complex Challenges Addressed by HESN Partners</u> .....	57

This is a focus group in Linthepe, a village in central Malawi. Farmers engage in a community game called “Winds of Change” prior to the focus group. This ice breaker serves as a way to get them familiarized with each other so they feel more comfortable discussing new crops and technologies they are adopting.



PHOTO: ELLIS ADAMS

# INTRODUCTION

Greetings!

The vision for the Higher Education Solutions Network (HESN) first came to us in 2011 in the midst of building a team at USAID to support science and technology (S&T) for development. We dreamed of a world where universities served as platforms in this evolving space. Our idea was to change the face of development by tapping into the innovation, passion, and technical expertise found within universities worldwide. As we worked toward making this vision a reality, we found there was a strong desire among universities to work across sectors and disciplines to address global challenges. However the incentives and models to create these types of cross-disciplinary programs did not exist.

When HESN was launched in 2012 our original objective was to partner with the higher education community to leverage (1) the emergent trends in creating and testing new solutions for global development; (2) new data tools and techniques; (3) the changing landscape of S&T targeted to benefit the most vulnerable; and (4) how to harness youth worldwide focused on finding ways to impact society.

From the beginning, HESN was a labor of love. Our small team received 500 concept notes from interested universities, and searched through many exciting and innovative ideas. With partners across USAID, we realized our vision with a narrowed pool of eight university programs, known collectively as HESN Labs - the College of William & Mary, Duke, Makerere University, Michigan State, MIT, Texas A&M, and UC Berkeley.

The HESN Labs each had their own unique plan for how they would contribute to USAID's mission, and I had the honor of watching these plans expand from a vision to a reality. Over the first two years, we saw their partnerships grow and their initiatives expand. The programs encountered the expected challenges in trying to change the status quo, but in their tenacity and dedication, the solutions they found proved better than we could have imagined at the beginning.

USAID has a rich history of working with academia and research communities to build human and institutional capacity through U.S. partnerships with low- and middle-income countries, perform sector specific research, and evaluate development programming. These critical relationships have grown, and the success of HESN has provided new methods and pathways to more effectively leverage the power of S&T to the communities and countries USAID serves.

As our five year experiment comes to a close, I am struck by the differences in thinking that I see whenever I visit university campuses. We're excited to see the impact that we know the HESN programs will continue to have on the world. We're also drawing upon the lessons learned to continue our engagement with the higher education and research community.

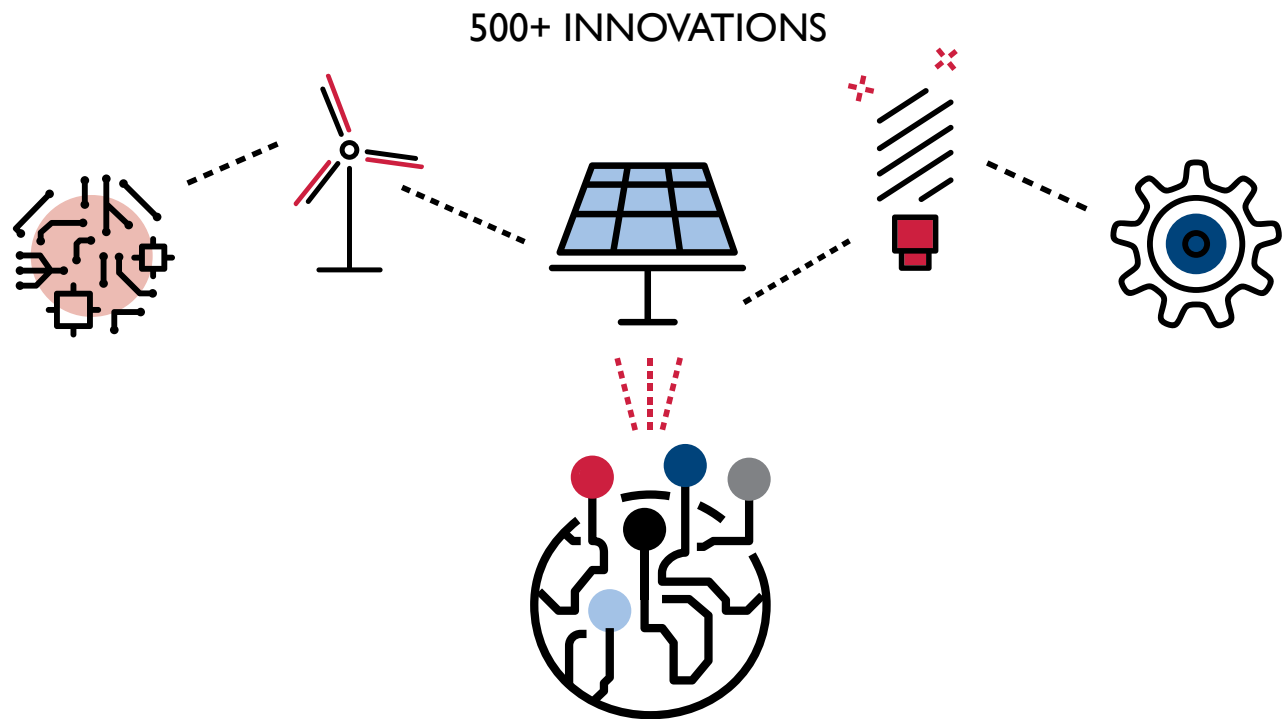
I am incredibly proud of the work showcased in this report and beyond it. In five years, the landscape of S&T for development has evolved rapidly. This report is just a snapshot of how HESN Labs endeavored to impact global development. I encourage you to explore further; beyond what is presented by each of the HESN Labs highlighted in this report. Ultimately we hope that the work and methods showcased here inspire you to think deeply and differently about the evolution of science, technology, and innovation in the context of development.

Warmly,



Ticora V. Jones Ph.D  
Division Chief - Higher Education Solutions Network  
Acting Center Director, Center for Development Research, U.S. Global Development Lab and U.S. Agency for International Development

# ADVANCES MADE WITH HESN SUPPORT



BENEFITING 16.7 MILLION PEOPLE



## Innovations

USAID's HESN has supported the creation and evolution of more than **500 new and existing innovations**, including **over 60 innovations that were evaluated using HESN resources**. These innovative approaches, technologies, and solutions have benefited an estimated **16.7 million individuals** in developing countries.



## Data

HESN resources have created **258 data tools, technologies and approaches**; **trained 2,000+ development professionals** in data management; and provided **over 300 data sets and 600 data analyses** for development institutions, enabling data-informed decision-making.



## Research

HESN resources have led to more than **300 articles, white papers, and other publications**. These research products have had many secondary impacts on faculty, students, development assistance practitioners, and social entrepreneurs in civil society, government, and the private sector in the U.S. and developing countries.



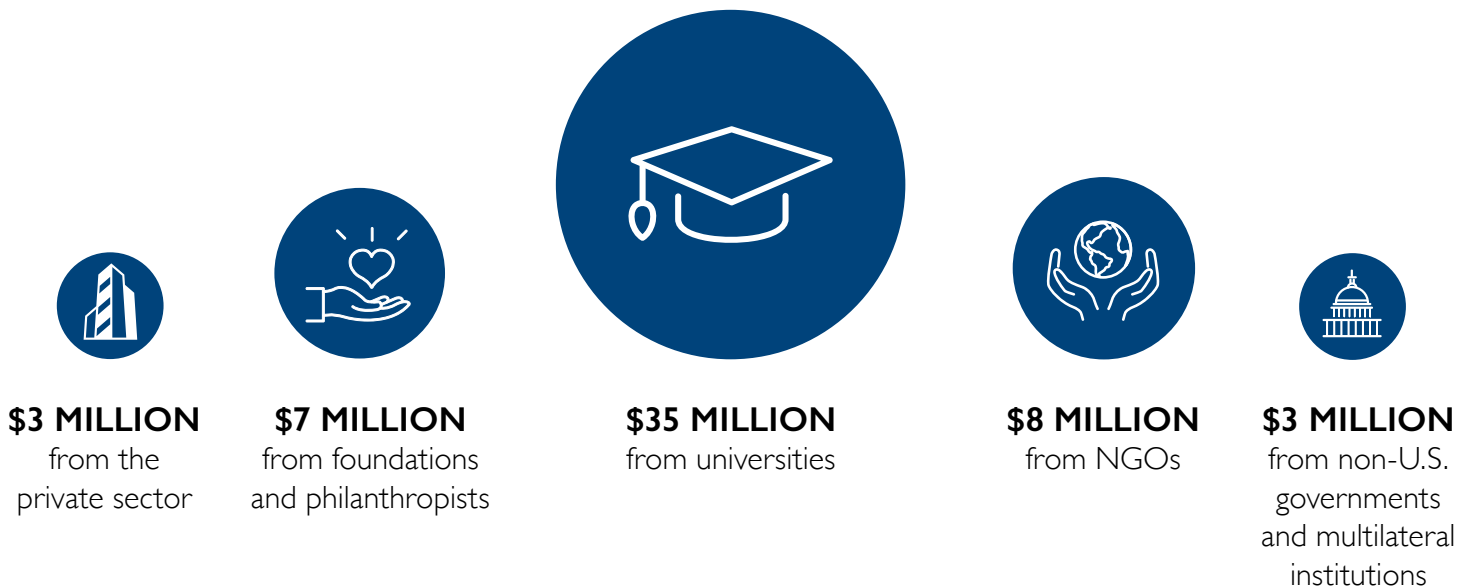
## Policy

HESN research initiatives have led to **23 high-impact program or policy changes** in institutions such as USAID's Global Development Lab, MasterCard Foundation, the Center for Disease Control and Prevention, and the Government of Senegal. HESN universities worked with these institutions to alter practices or procedures and encourage greater use of science, technology, and innovation in development.

# SUSTAINABILITY AND IMPACT

HESN's Development Labs achieve impact and influence beyond their institutions by leveraging external donors and working with the private sector, foundations, NGOs, social entrepreneurs, and other development agencies. Reaching outside resources increases the likelihood that the work will be sustained after the duration of USAID's funding, will have influence beyond the institution, and will benefit the broader academic community, including students, developing countries, USAID, and the development community.

To put into numbers how much funding HESN has leveraged:



Over the course of their engagement with the Social Entrepreneurship Accelerator at Duke (SEAD) program, SEAD entrepreneurs report having raised over **\$56 MILLION** in equity, debt, and philanthropic support.



*As of late 2016*

# The Development Labs

*HESN is a consortium of organizations that have sourced nearly 500 innovations in 89 countries with more than 798 partners.*

The labs funded by the Higher Education Solutions Network are:

**AidData:** AidData Center for Development Policy, The College of William & Mary

**ConDev:** Center on Conflict & Development, Texas A&M University

**CITE:** Comprehensive Initiative on Technology Evaluation, Massachusetts Institute of Technology (MIT)

**DIL:** Development Impact Lab, University of California, Berkeley

**GCFSI:** Global Center for Food Systems Innovation, Michigan State University

**IDIN:** International Development Innovation Network, Massachusetts Institute of Technology (MIT)

**RAN:** Resilient Africa Network, Makerere University, Uganda

**SEAD:** Social Entrepreneurship Accelerator at Duke, Duke University

In the picture Mona Mijthab (pictured right), Design Facilitator of IDDS Hogares Sostenibles, sits and talks with Marta, a woman she met at the market selling fruits and vegetables. Building local networks and understanding the context is one of the most important parts of the co-creation design process.

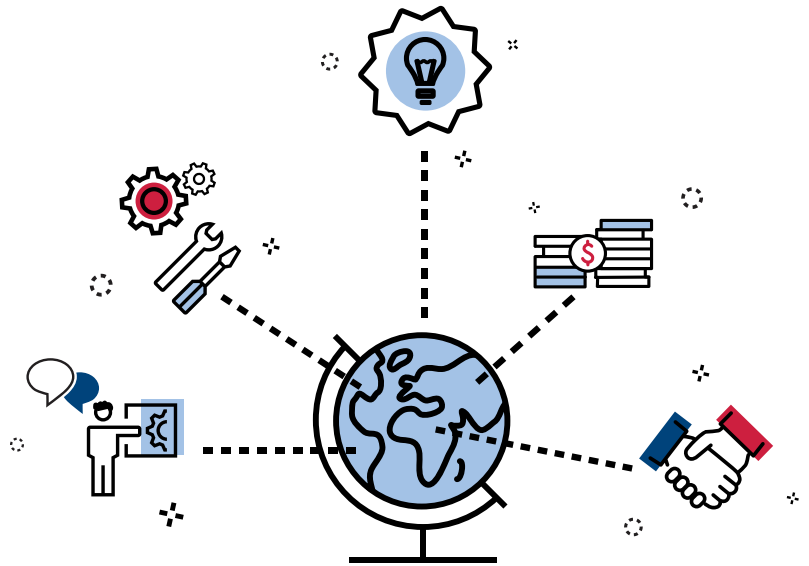


# The Collaborative Design Approach

*Human-centered and Collaborative Design approaches have made significant changes to development work. Through HESN, our partners have harnessed these tools to create deep community-based and multi-stakeholder partnerships, as well as economic empowerment.*

MIT's **International Development Innovation Network (IDIN)** uses a collaborative design model focused on sparking the earliest stages of innovation. High-potential innovations receive additional support to pilot and scale.

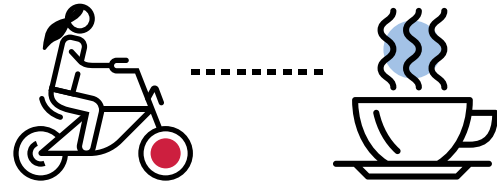
IDIN-supported **Innovation Centers** provide “maker spaces” for innovators who want to make a social impact in their community and beyond. The centers connect IDIN network members with resources and training to develop low-cost, practical technologies to alleviate poverty. They also offer access to workshop space and tools, educational programs, and a marketplace for buying, selling, and trading technologies that are created by local innovators. Centers are up and running in Brazil, Colombia, Ghana, India, Kenya, Nepal, Sierra Leone, Tanzania, Uganda, and Zambia. To date, local innovators have leveraged these centers to develop dozens of innovations, including a drip irrigation kit and a solar water heater. The centers are inspiring and supporting a culture of innovation in local communities. The centers are especially welcoming to youth and have introduced hundreds of young people to the concept of innovation and making inventions by hand.



At IDIN's multi-week **International Development Design Summits (IDDS)**, participants from numerous countries and backgrounds learn about creative capacity building, human-centered design, and building prototypes that address local development challenges. Between one-quarter and one-half of summit participants are from the community where the summit is held. Their local knowledge leads to more appropriate and locally relevant innovations. With HESN support since 2013, IDIN has held summits in Africa, Asia, and South America that have generated dozens of innovative prototypes aimed at improving quality of life, especially for low-resource communities. IDIN-supported solutions, including those generated at IDDS events, have gone on to improve the lives of over 500,000 people around the world. Two-thirds of IDDS attendees go on to teach others what they have learned through workshops, events, trainings, social ventures, and more. Examples include:

- A summit in Botswana invited members of the indigenous San communities to build on their creative adaptations for living in challenging desert conditions. Teams invented tools such as a fodder chopper, a precision planter, and a machine to repurpose plastic bottles into useful strips.
- A summit in India produced prototypes to improve access to healthcare in resource-poor communities, such as a low-cost resuscitation device for newborns and a home-based medication and diagnosis delivery system.

- The “Zero Waste” Summit in Colombia generated ideas for inclusive waste management and inventions such as a public space for recyclers and bricks made of recycled materials.
- At “Rethink Relief” in Uganda, refugees worked with development professionals to create simple technologies to ease life in refugee camps, such as a device to capture rain for drinking water and a “Make Your Own Light” kit.
- A bicycle-powered coffee bean sheller was among the imaginative concepts generated at a summit in Tanzania that focused on low-cost and practical technologies with the potential to alleviate poverty.
- At the Maternal and Neonatal Health Summit in Tanzania, teams gained an in-depth understanding of local problems and produced briefs to inform future design teams.
- In Zambia, teams designed more efficient stoves and kilns, and produced menstrual pads with local material.
- At a summit in Pakistan on communication technology, participants proposed using SMS messaging so door-to-door health workers can log and retrieve household-level vaccination information, and women entrepreneurs can better market their products. A smartphone app was introduced to help teachers with overcrowded classes plan courses, grade papers, and play audio lessons; and an advice hotline was proposed to engage fathers in issues of maternal health.
- In 2016, a summit in Colombia focused on innovation in education, a summit in Brazil focused on livelihoods and permaculture in the Amazon rainforest, a summit in Uganda focused on cookstoves, and a summit in Botswana focused on desert livelihoods. A summit in Zambia involved private sector actors from MIT D-Lab’s Practical Impact Alliance as participants in co-design with local community members and social entrepreneurs.
- Summits were held in Guatemala, Colombia, and Thailand in 2017 on sustainable development including housing and climate change adaptation.



Summer session participants from the IDDS Educacion program in Colombia are deeply immersed in the creative process.



PHOTO: OMAR CRESPO CARDONA, IDI



# SEVAMOB

India, Lesotho, South Africa | sevamob.com

*Providing primary healthcare and dental care to people at the bottom of the economic pyramid through a subscription-based model*

**SUPPORTED BY**

Social Entrepreneurship Accelerator at Duke

**FOUNDER**

Shelley Saxena



Photo: Sevamob



**PROBLEM ADDRESSED**

Quality of life and longevity are decreased when people experiencing poverty live far from health facilities or lack awareness of healthy lifestyle habits. Few companies have been willing to invest in building a health infrastructure for people in low-income communities.



**INNOVATIVE IDEA**

Preventive care and prescriptions are delivered to low-income communities by mobile clinics with the help of mobile technology. Clinic workers collect patient information using Android tablets and upload the data to a central cloud server. The records are accessible during follow-up visits and via a 24-hour telephone call center.



**RESULTS**

Dental problems throughout selected Indian communities decreased by 30 percent, and malnourishment decreased more than 15 percent orphanages and schools throughout Karnataka State. Other results include decreased anemia rates due to early detection and decreased infectious disease rates through awareness interventions.

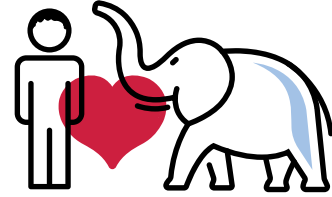
The **ResilientAfrica Network (RAN)** uses the **Collaborative Resilience Innovation Design** approach to facilitate innovative project designs that are started and led locally. Under this approach, RAN convenes teams of experts and guides them through a co-creation process to design projects that address system-level problems. Organizations then compete to host and test these projects.

- To minimize the spread of Ebola, victims are treated in tents, and workers wear protective gear. But in hot conditions, the tents and gear can pose new health problems for patients and staff alike. RAN used a collaborative design approach to reimagine treatment tents. Students in architecture and mechanical engineering at Makerere University, Uganda, met weekly to design prototypes of an Ebola treatment unit in cooperation with a team of engineers, social scientists, epidemiologists, artists, public health specialists, nurses, and medical doctors, among others. As a result, the team created a double-peaked roof with vents and porous walls to naturally increase airflow within the tent. As the RAN team moves forward to test and refine the design, USAID will provide support, with the ultimate goal of a manufacturer partnership.
- In the Horn of Africa, recurrent droughts are difficult for nomadic communities that subsist on livestock. One of the labs in the ResilientAfrica Network — the Horn of Africa Resilience Innovation Lab based at Jimma University in Ethiopia — hosted a Collaborative Resilience Innovation Design workshop in Ethiopia to generate ways of coping. Teams concluded that developing a stable water resource infrastructure would strengthen herds, stabilize communities by enabling them to branch into new livelihoods, and increase entrepreneurial activity in the region. The Horn of Africa lab will invite entrepreneurs to propose projects on those themes, with the most promising ideas receiving grants of up to \$200,000.

**The Center on Conflict and Development (ConDev)** at Texas A&M University encourages student innovators and entrepreneurs to design tools and techniques that can be used to highlight issues and solve problems in the developing world, focused largely on mitigating conflict.

- **Human-Elephant Conflict Workshop in Botswana:**

ConDev teamed up with in-country partner Ecoexist and MIT's D-Lab to bring together student and faculty innovators from around the world for a five-day workshop in Botswana to address human-elephant conflict.



- **Aggies Invent:** ConDev collaborates with Texas A&M University's Engineering Innovation Center to bring together students from across the Texas A&M campus to develop innovative solutions for field projects over the course of 48 hours. In October 2015, the winning team of students designed a Pigeon Pea Desheller that can be used by Guatemalan farmers.

- **South African Youth Develop Community-based Business Plans:** ConDev spearheaded a business plan development competition to encourage entrepreneurship among youth in Knysna, South Africa. The competition sought to integrate young people into the mainstream economy of Knysna, where unemployment and poverty are rife, especially amongst school drop-outs and youth.

- **Aggie Engineers Design Washing System:** In addition, students from Texas A&M's Engineering Projects in Community Service (EPICS) course conceived new technologies to improve the washing system for leafy vegetables in Guatemalan packing centers. Texas A&M student Madison Cooper was invited to showcase the team's prototype at USAID's TechCon Innovation Marketplace at MIT in November 2016.

- **High School Students Improve Cart Design for Guatemalan Farmers:** Texas high school students designed an improved cart for flower growers in Guatemala's central highlands. Students from Hebron High School worked on several designs for a cart to collect cut roses in greenhouses.

The **Development Impact Lab (DIL)** at UC Berkeley established a new academic discipline called **“development engineering”** to catalyze collaboration among students in the social sciences and STEM fields (science, technology, engineering, and math). For example, the course “Designing Innovative Health Solutions” teaches strategies for collaborative design of innovative public health solutions, while “Collaborative Innovation for New Engineering Solutions” emphasizes engineering design and prototyping. Students work in teams to develop novel solutions for real-world problems in partnership with over a dozen NGOs and social enterprises who are now working to implement those solutions. Class projects have included the feasibility of self-disinfecting toilets in Kenyan slums and algae removal options for a Guatemalan lake. Over 100 students have taken courses in UC Berkeley's Development Engineering program, and several universities across the globe, such as École Polytechnique Fédérale de Lausanne in Switzerland, are now incubating their own Development Engineering programs, inspired by the work at UC Berkeley. This list of universities launching similar programs continues to grow steadily and now includes Iowa State University, University of Waterloo in Ontario, Canada, and University of Canterbury in Christchurch, New Zealand.

**The Social Entrepreneurship Accelerator** at Duke promotes collaborative design through events such as the three-day **Health Hackathon** in Kenya in 2015. The multi-disciplinary collaborative event enabled connections between social entrepreneurs and health and technology professionals. More than 100 participants representing 20 teams pitched innovative health technology solutions to a panel of expert judges on the topics of healthcare access, communicable diseases, and maternal and child health. The winning projects included home monitoring systems for diabetics and children with acute respiratory infections; bar-coded medical records to improve access for HIV patients; and voice-message child health advice for mothers with visual impairment or low literacy. Top projects received prizes and mentoring. Toto Health, the winner for improving maternal child health, expanded their offerings during the hackathon to include voice messages that provide information and alerts to mothers during pregnancy and throughout the first 5 years of their child's life. They've since monitored the progress of more than 35,000 pregnancies and exchanged nearly 4 million text messages.

## INVENTION SPOTLIGHT

# AID MANAGEMENT PLATFORM GIS MODULE

Worldwide | [amis.mof.gov.np](http://amis.mof.gov.np)

*The Aid Management Platform GIS Module enables governments, donors, civil society, and beneficiaries to visually understand where development assistance activities are occurring.*



Photo: Development Gateway

### SUPPORTED BY

AidData Center for Development Policy at the College of William & Mary

### CREATOR

Development Gateway



### PROBLEM ADDRESSED

Policymakers can spend their aid dollars more effectively when they know about existing development assistance activities with a high degree of detail — what is being done, by whom, where, and why. Policymakers can direct support to communities that need them most, coordinate efforts to reduce duplication, and monitor outcomes to promote aid effectiveness. But policymakers facing time-sensitive decisions cannot study large-scale datasets. They need a quickly comprehensible presentation such as a map.



### INNOVATIVE IDEA

Development Gateway (DG), a nonprofit partner of the HESN-funded lab AidData Center for Development Policy, had previously created the Aid Management Platform (AMP) as a tool for government officials and other stakeholders to track and monitor development projects. With HESN's support, and in close consultation with host country government users, DG designed and implemented a new AMP GIS portal. The use of geographical information systems, or GIS, enables this information to be displayed visually so that stakeholders can easily see where aid funds are allocated, understand patterns, identify gaps, and make decisions based upon evidence.



### RESULTS

Governments and other stakeholders now have access to cutting-edge GIS platforms for aid management in 18 countries (anticipated to be 20 at the conclusion of the HESN award). AidData trained stakeholders how to use GIS data for planning and monitoring aid projects

# Research

*HESN puts scientific research into action for impact in development assistance.*

HESN supports sophisticated research to illuminate a problem's nuance and identify solutions. Using strategic partnerships, HESN programs are able to rapidly integrate findings into the field, increasing the likelihood that ongoing interventions will succeed. Here are some of the research questions that HESN-supported labs have answered.



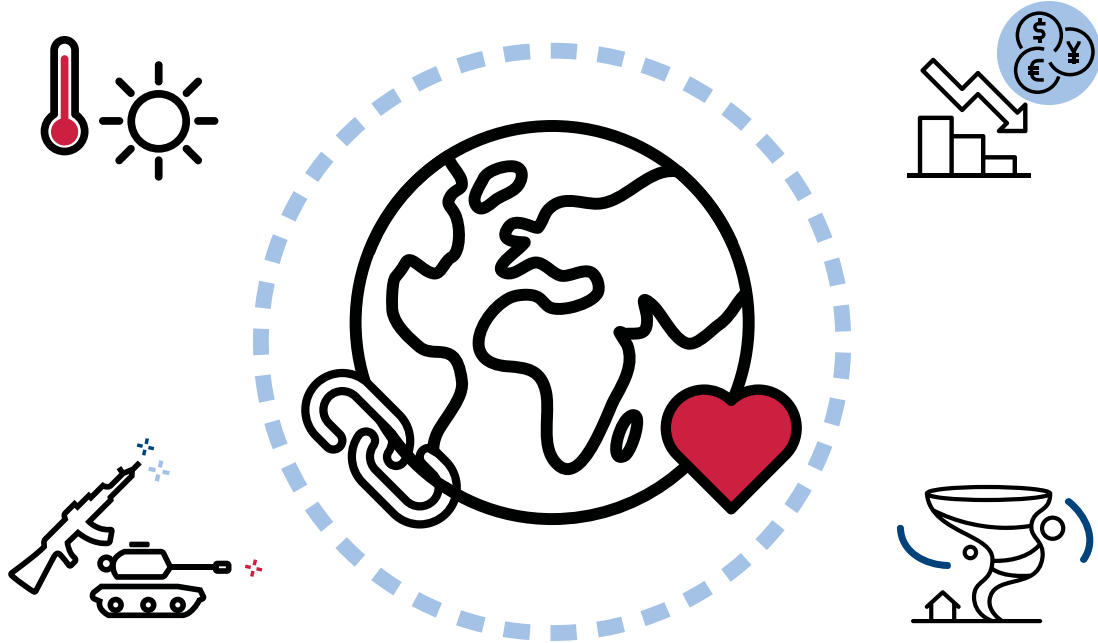
AidData Summer Fellow Amy Leung presents on open data to staff at the Affiliated Network of Social Accountability (ANSA) office in metro Manila.

## Where is a breakthrough most needed?

...and where could innovation do the most good? The Institute for Globally Transformative Technologies at Lawrence Berkeley National Laboratory has an answer to those questions thanks to funding through the Development Impact Lab (DIL) based at UC Berkeley. Researchers at the Institute asked 500 experts to choose social problems for which **the introduction of a breakthrough technology would have the biggest impact on improving quality of life for the poor**. The Institute methodically chose the 50 most promising areas for intervention and, striving to “focus collective effort on the breakthroughs that really matter,” they publicized the **50 Biggest Breakthroughs**.

The number one most promising area, for instance, points out how much the world would gain if the scientific community discovers a new method of water-desalination that is affordable and uses renewable energy; this would go a long way to reducing the coming global shortage of potable water. Number 12 urges someone to develop “microbicides to provide a method of protection against HIV/AIDS and human papillomavirus for women.” Number 25 calls for great minds to invent “nutrient-dense and culturally appropriate foods for infants to complement breast milk during the weaning period.”

The researchers ranked the difficulty of each of the 50 areas according to potential obstacles, technical challenges, and profit potential in order to “provide funders with a guide to asking the right, hard questions as they evaluate their investment options.”



### **What are the building blocks of resilience, and how do you strengthen them?**

The ResilientAfrica Network (RAN), the HESN-funded network of labs anchored at Makerere University in Uganda, is premised on the belief that communities can overcome the shocks of conflict, disaster, drought, and other stresses because of the strengths that make the communities resilient. **But where exactly does “resilience” reside in a community?** How do you measure it, let alone figure out how to increase it?

RAN found a way. Teams from 18 African universities conducted participatory assessments in communities across Africa in which residents helped define their needs and identify what gives their communities resilience. The research that followed looked deep into the communities and how their problems interact with their strengths. They separated the workable from the intractable — many factors make a community vulnerable, but some of the causes are too entrenched to be fixed by an intervention at the community level.

Other factors may contribute to a community’s challenges or resilience, but they are not centrally important to addressing the problem. RAN’s research framework helped identify which factors could be improved by changes in behavior or policy and would have the greatest impact on the problem. These factors were highlighted as “entry points,” and RAN is inviting the development community to innovate and invest in them.

For example, in South Africa’s Pyramid region, where chronic drought pushes men to travel far for work, RAN recommended strengthening the ability to raise livestock locally through marketing facilities, coordinated sales, systems to inform small producers about prices and market requirements, and farmer business schools.

RAN and its core partners — George Washington University, Stanford University, and the Center for Strategic and International Studies — published their conclusions as *The State of African Resilience*, which they have presented to hundreds of regional stakeholders and disseminated throughout Africa via international bodies. The team is preparing a yearly update and sharing knowledge about resilience globally through video training clips, presentations to academic and international organizations, and course development at universities.

# GRIDWATCH

Kenya, Tanzania | [dil.berkeley.edu/gridwatch](http://dil.berkeley.edu/gridwatch)

*Making smart phones and smart meters to automatically sense and report blackouts, brownouts, and grid reliability and power restorations with high temporal and spatial accuracy.*

## SUPPORTED BY

UC Berkeley Development Impact Lab

## FOUNDERS

Dr. Prabal Dutta and Dr. Eric Brewer

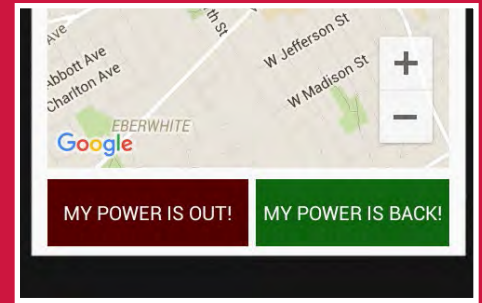


Photo: UC Berkeley



### PROBLEM ADDRESSED

In many countries, the power grid is riddled by outages—with results ranging from disrupted work time and spoiled food to heat-related deaths. Utility companies in developed countries often use smart meters to monitor household power. These meters take high fidelity measurements and can determine the location and length of outages, but they also can be prohibitively expensive—even today less than 50 percent of American homes have them. Meanwhile, utility companies in developing countries cannot afford to widely deploy smart meters and are forced to rely solely on customer feedback to understand the reliability of the power they provide.



### INNOVATIVE IDEA

GridWatch is an effort to use everyday smartphones to determine the presence or absence of power using existing built-in phone sensors, and crowdsource those measurements to monitor grid-level power outages and restorations. Smartphones were deemed an attractive solution because of their ability to transmit data over the cellular network even during grid outages. By combining advances in machine learning, distributed data-stream processing, and complex network analysis, the GridWatch team seeks to demonstrate that crowdsourced data streams can leapfrog some of thorniest energy problems in the world's least industrialized countries.



### RESULTS

The GridWatch mobile app has been developed and is in public beta testing. The research team is testing stability on different Android platforms, the energy cost of GridWatch, and how users interact with GridWatch.

## How can good ideas in health find money?

The Social Entrepreneurship Accelerator at Duke (SEAD) and the Calvert Foundation researched 115 organizations and financiers and found the bottlenecks stifling impact investing in global health. They found that investors are making investments, though with little debt, for startups in the launch phase; but investors are not investing as much in the subsequent growth phase. Banks often can't participate in startup business models, and most private equity funds offer financing for later-stage enterprises. The funding that's available has high debt costs. "Local companies are unable to access old-fashioned growth financing through debt," an interviewee told them. "Either debt is unavailable, available at crazy high rates, or needs too much collateral."

In order to give investors confidence about supporting innovators during the growth phase, SEAD and Calvert created a guide to figuring **what type of financing is most appropriate for the innovation**, depending on two main variables: the type of health product or service, and the demographics of the target end user.

One example would be a proposed venture in the area of mobile apps that increases health-care efficiency. If the entrepreneur plans to go after low-income customers in urban populations, those customers will be sensitive to the price of the service, and some may not have access to the necessary technology. So the investor should provide financing with an "impact investing" model that measures its return based on the social benefits in addition to the financial return. If the entrepreneur is targeting low-income customers in rural populations, they

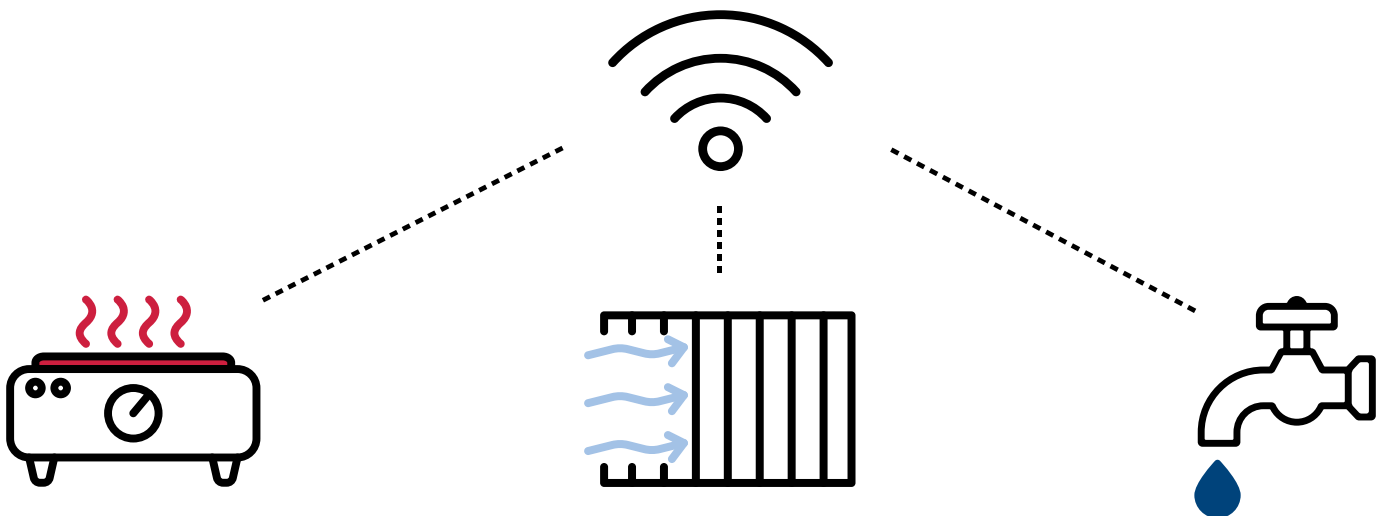
may face the additional hurdle of inadequate telecommunications infrastructure. In that case, the investor should consider making a grant, which seeks a social return but does not require a financial return. However, if the entrepreneur is addressing high-income customers who are presumed to have good access, infrastructure, and ability to pay, then the investor should offer traditional financing which emphasizes financial return.

Innovations working on a different part of the value chain that makes up the health system will have different challenges. “For the greatest chance of successful investing in the sector, we learned that you have to understand the market challenges at the intersection of the population and piece of the chain,” the researchers wrote. “Investors should assess and understand the typical market failures associated with the segment of the value chain and the consumer population targeted to see if the capital can be flexible or patient enough to overcome market challenges.”

### How can we bring data to decision-makers rapidly?

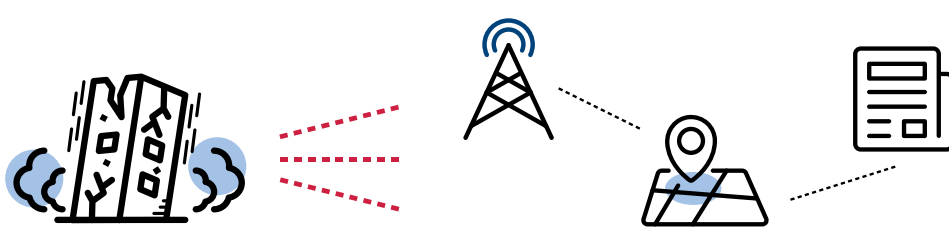
...and how can we improve the way they use data? Many HESN Labs address this challenge.

More than half of the funded projects at UC Berkeley’s Development Impact Lab (DIL) send back data on results remotely via **wireless** technology. For instance, in order to design an efficient way to bring electricity to low-income communities far from the grid, DIL’s Rural Electric Power Project uses smart meters to measure residents’ power use. DIL, in partnership with the University of Michigan, is also developing GridWatch, a system that uses mobile phones to detect power outages and other conditions in the electrical grid, providing a new independent source of information for regulators, customers, and researchers. Another DIL partner, Portland State University, is monitoring the performance of manual water pumps, household water filters and stoves in Rwanda via remote sensors. Specifically, the Tubeho Neza program, jointly run by the Rwanda Ministry of Health and non-profit DelAgua Health, uses the sensors to help inform WASH policies at the local and national levels. The AidData Center for Development Policy is working to make data “actionable” or readily available in a form that can be applied to pressing policy questions. To make aid information more usable, the AidData Center mapped more than \$724 billion of aid projects by “geocoding” the precise locations of project activities. This enables policymakers to easily see the allocation of funds and integrate these data points with statistics on local development conditions to see whether aid is going to the areas of greatest need and opportunity. Policymakers can add different data layers relevant to the nature and focus of a particular aid program. For example, AidData collaborated with President’s Emergency Plan for AIDS Relief (PEPFAR) Nigeria to layer geocoded project data with HIV/AIDS prevalence, poverty, and road network data to assess whether PEPFAR’s programs were successfully reaching the most vulnerable communities.



AidData's Research Consortium (ARC), a global network of 120 scientists across a wide variety of disciplines, tackle the most difficult policy questions by developing innovative research methods that take advantage of geospatial data. ARC members partner directly with USAID to put these insights to practical use. For example, two ARC researchers at Stanford University received a grant from AidData to improve sub-national poverty measurements using satellite imagery and machine learning to process those images more effectively. Their research was published in the prestigious journal, *Science*, and was later named one of *Scientific American's* **10 World Changing Ideas** for 2016. USAID and other aid agencies can now use their poverty measurements to inform program placement and evaluation.

Access to actionable, precise data and the ability to use it can save lives, as AidData proved when a massive earthquake struck a remote, mountainous region in Nepal in April 2015. AidData coordinated researchers, undergraduate students, and local partners in Nepal to create an online dashboard providing information including geotagged news reports and videos, mapped aid projects, landslide risk data, and satellite-based damage maps. USAID's Disaster Assistance Response Team (DART) and local partners like Save the Children Nepal expressed that AidData's efforts provided critical information to help them make rapid decisions, with one official at Save the Children noting the "effort has really supported us to make decisions on recovery in Nepal."



"Data for decision-making" requires understanding the human component as much as the technology. To meet this need, AidData has studied aid decision-making processes in Honduras, Nepal, Philippines, Senegal, and Timor-Leste in order to identify the major barriers to data use and opportunities that might make it easier for officials to use data in their decision-making. AidData's "Listening to Leaders" survey will ask 55,000 policy-makers in 126 low- and middle-income countries to identify what data they want to use. AidData researchers use their observations to design tools customized based on the needs of development practitioners. AidData's Geo(query) tool uses supercomputing power at the College of William & Mary to make it easy for users to search, merge, and export dozens of geospatial data sets for analysis.

Experts have long believed that **bullying** affects the victims' performance in school. USAID was able to demonstrate the effect precisely thanks to an analysis by Texas A&M University's Center on Conflict and Development (ConDev). At USAID's request, ConDev's Strategic Analytics Lab rapidly crunched data on school violence in Ghana, South Africa, and Botswana. They found that victims' grades in science are especially likely to decrease when they're bullied; that the effect on grades is worse in middle school than in elementary; and that bullying has a stronger correlation with decreased grades than numerous other factors such as age, gender, and parents' education level. As a result of ConDev's work with USAID, their report was cited in a UNESCO policy paper and led to further research on the topic.

### **How do you make the research subject an equal partner?**

The International Development Innovation Network (IDIN) and Comprehensive Initiative on Technology Evaluation (CITE), the two HESN-supported labs at MIT, spearhead the Lean Research Initiative. "Lean" research aims to improve rigor and relevance for both research participants and those who might use the findings in their own work. It also ensures that the time, effort, and experience of research participants are respected throughout the process. The result is research that is "right-sized", or only seeks resources, participants, and data that are critical to answering the question at hand.





Water defluoridation center in Nakuru, Kenya relies on the bonechar technology. People pay a few shillings to fill up their jerrycans daily from the water kiosk, which is operated by community residents. As evident in the picture, the kiosk was funded by USAID projects.

CITE used the Lean research approach in its evaluation of water test kits in India. When testing the effectiveness of water test kits, the water quality test results were immediately provided to the participants. When visiting a community, the research team provided community members with a training on water and sanitation awareness. The researchers enabled stakeholders to customize the evaluation results based on their own ranking of criteria.

A similarly inclusive and respectful approach was used by the ResilientAfrica Network and its core partner Stanford University when assessing community challenges around Africa and possible solutions. Polls often ask people for information without explaining the overall research question. Respondents who are under-informed on the topic may feel pressured to give a response anyway. RAN partners instead engaged communities in “deliberative polling.” The method is based on the premise that, if communities understand the purpose of a development intervention and feel involved, consulted, and engaged in it, they are more likely to support it. Deliberative polling picks a representative sample of a population, informs them about a set of policy options, and allows them to consult with peers with the goal of creating more informed judgments.

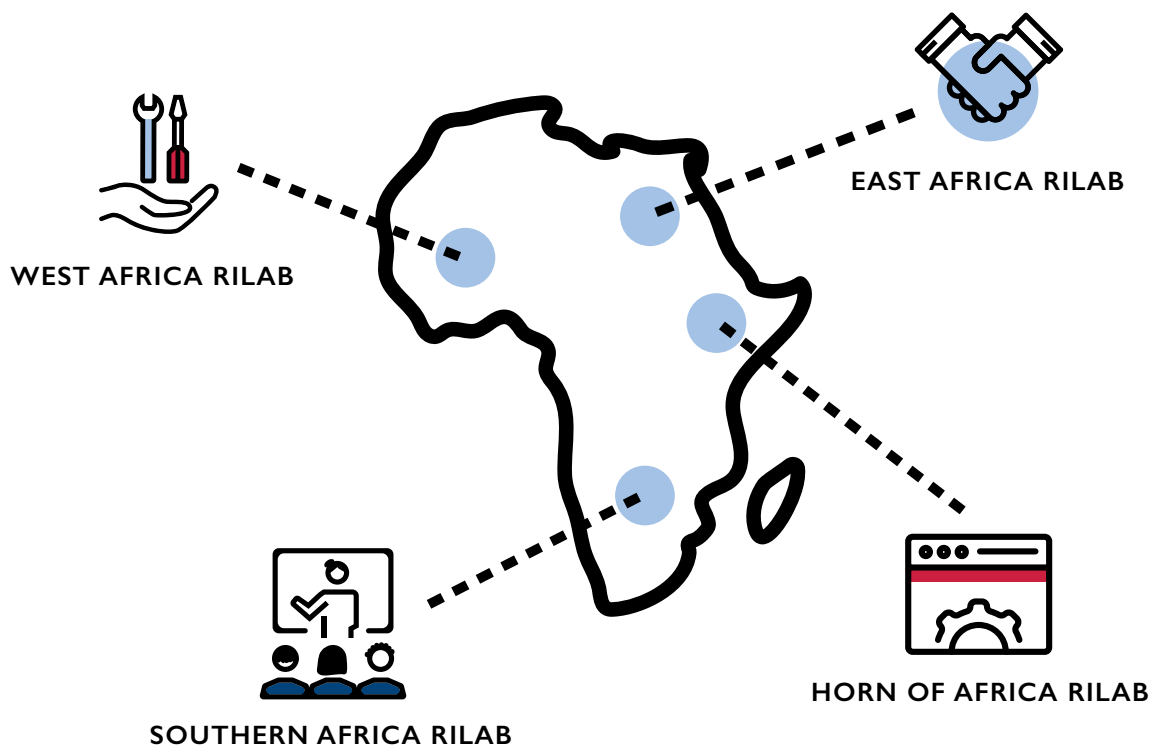
At Michigan State University, the Global Center for Food Systems Innovation (GCFSI) supports participatory research that engages the local residents. GCFSI provided an innovation challenge grant project that will test irrigation innovations in East Africa. Each research site has a management committee of local farmers who will shape how to evaluate the results. One such project in Uganda united a researcher from University of California-Davis, local farmers in Kampala, and an engineer of an irrigation intervention to discover a system that can quickly adapt to unforeseen challenges. By developing strong local relationships and integrating the end user’s voice into the research approach, GCFSI ensures uptake and sustainability of the innovation.

# Local Platforms, Local Problems, Local Partners

*Catalyzing local communities of innovation.*

HESN Labs and partners have been critical elements of growing global innovation and entrepreneurship with a hyper local focus. HESN Labs do more than partner with institutions in other countries and support individual innovators. HESN Labs engage entire communities of local innovators in problem-solving in order to catalyze a culture of entrepreneurship that will continue and grow. **Some examples:**

The ResilientAfrica Network (RAN) spans sub-Saharan Africa through regional labs in four regions — East Africa, the Horn of Africa, Southern Africa, and West Africa. Each of the labs — known as Resilience Innovation Labs, or RILabs for short — reach out to the community of innovators in each region to offer support, nurturing, and technical assistance. Each lab offers space and mentoring to provide constructive feedback to up-and-coming innovators. Each lab has a robust capacity building program to help innovators refine their ideas, with workshops on topics such as the human-centered design approach, business modeling, research, communication, intellectual property, monitoring and evaluation, and documentation. In order to foster community engagement between innovators and potential users, each lab has coached innovators on designing solutions appropriate to the community's self-perceived problems. The RILabs assist innovators in obtaining resources to scale-up their ideas, connecting them with potential funders, mentors, other innovation hubs, and growth initiatives.



As part of the emerging Africa innovation scene, RAN has also engaged with UC Berkeley's Development Impact Lab to be a key collaborator on the *Big Ideas* contest, encouraging and supporting many teams of students to participate. *Big Ideas* is an annual contest aimed at providing funding, support, and encouragement to interdisciplinary teams of students who have "big ideas." RAN innovator, as well as TechCon and *Big Ideas* winner PedalTap was recently named a winner in Johnson & Johnson's inaugural Africa Innovation Challenge. RAN faculty have also been engaged in *Big Ideas* as mentors and judges. This opportunity has allowed for the labs to identify young, talented, and budding entrepreneurs who propose innovations to local challenges, several of which have gone on to win additional prizes.



PHOTO: SYEDA UH SAJIN

Group photo of GCFSI team and villagers in Malawi, Africa.

The Social Entrepreneurship Accelerator at Duke (SEAD) works through its East Africa office to develop partnerships with local investors, corporations, and universities to strengthen the innovation ecosystem for healthcare in the region.

- The East Africa office works with SEAD's selected innovators to advise and assist them in their efforts to scale-up and strengthen their work in the region. In response to innovators' perceptions of their challenges, SEAD East Africa held a workshop on "design thinking" that in part taught innovators how to understand their customer bases and incorporate customer feedback into upgrading their products. With a focus on women and girls, the SEAD East Africa office gathered women leaders from eight organizations in East Africa's healthcare sector for an event to address challenges faced by women entrepreneurs, as well as emerging opportunities in the region. Participants resolved to explore ways of highlighting the contributions of women entrepreneurs. The teams learned new ways of sharing their process and learning with internal and external audiences, such as funders, as well as core principles of design thinking.
- SEAD looks to connect innovators to new funding partnerships. SEAD partner, Investors Circle (IC), brought social impact investors from the U.S. to Kenya to explore opportunities for local investments in healthcare innovations. The U.S. investors visited innovative companies and hospitals, met local investors in roundtable discussions, heard pitches from investors, and provided feedback. As a result, seven companies in East Africa are in the final steps of adoption, three companies have received over \$100,000 in funding, and trip attendees have shared company information with IC's network of 225 investors.

The Global Center for Food Systems Innovation (GCFSI) based at Michigan State University is strengthening communities of academic researchers and entrepreneurs in East Africa through training, grants, and exchanges.

- As the world races to meet growing energy needs, renewable energy entrepreneurs in East Africa are sharing ideas through visits supported by GCFSI. GCFSI is funding a project through which Assistant Professor Rebecca Larson of the University of Wisconsin-Madison and innovator Vianney Tumwesige of Uganda are trying to improve systems for converting waste into energy. The process — anaerobic digestion — turns waste, including human and animal waste, into biogas for cooking, as well as manure for agriculture. Larson and Tumwesige developed a solid-liquid separation system that reduces the amount of water necessary for the process and increases the product for field application. Subsequently, they installed over 50 systems in the region surrounding Kampala, Uganda. The team successfully modified a refrigeration system to run on biogas, and installed 15 of the biogas absorption chillers. Margaret Atele of Kumi, Uganda, saw her milk losses drop by 10 liters a day after she installed a chiller. With Margaret's increased revenue, she expects to have the chiller paid off within a year-and-a-half. To facilitate collaboration and peer-to-peer learning, the project team visited the site of another innovative approach to anaerobic digestion in neighboring Rwanda. "They were really inspiring each other. Some Ugandans saw how great the site was in Rwanda, and it drove them to develop their site to be better," Larson said. "The connection built had quite a bit of immediate impact." In Rwanda, the company Habona made biogas the center of a number of agricultural activities with teaching activities on site. Adapting the idea, the Ugandan innovators added a plant nursery, mushroom cultivation, and are raising cows adjacent to their biogas system, and they plan to offer classes. The team passed on the inspiration with visits to other demonstration farms in Uganda, and they are pursuing collaboration with counterparts in Rwanda and Mali.

## INVENTION SPOTLIGHT

### AYZH CLEAN BIRTH KIT

Afghanistan, Ethiopia, Ghana, Haiti, India, Laos,  
Malawi, Myanmar | [d-lab.mit.edu/scale-ups/clean-birth-kit](http://d-lab.mit.edu/scale-ups/clean-birth-kit)

*A simple \$2 birth kit containing the six essential tools required to ensure safe and sterile conditions at the time of childbirth*



Photo: MIT

#### SUPPORTED BY

MIT International Development Innovation Network  
and the Social Entrepreneurship Accelerator at Duke

#### FOUNDER

Zubaida Bai



#### PROBLEM ADDRESSED

One million mothers and newborns die annually from infections linked to unhygienic birth practices.



#### INNOVATIVE IDEA

The kits are packed and distributed by local women, providing sustainable employment in impoverished areas. With assistance from IDIN, Ayzh is developing a franchise model to scale-up.



#### RESULTS

Provided sanitary births for 500,000 mothers and newborns. With a strong business plan, the product could reach 6 million women in the developing world within five years.



PHOTO: BIANCA J. ANDERSON, IDIN

As part of the International Development Design Summit in Arusha, Tanzania, students presented final prototype presentations.

- GCFSI provides start-up grants to entrepreneurs who identified specific local problems. This serves to catalyze the scholars' skills in creating practical solutions. For example, processing constraints make it difficult for small- and medium-scale farmers to compete with large-scale operations of growing cassava, an important subsistence crop in Tanzania. Two grantees are working to level the playing field by developing a low-cost processing system that produces high-value cassava flour with virtually no waste. The developers have mobilized women in the area through their greener cassava processing system, which leads to zero waste and enhances market access by entrepreneurial businesses. The developers have presented the new system to leaders at Ukaya, a major cassava-processing business, and led a training program that taught women how to prepare cassava tubers for processing; grate, press and load tubers into the dryer; and utilize the cassava peels for biogas production. These ten women are now training other women on how to use the system.

Engaging local communities in innovation is a priority at the collaborative design events such as IDDS, held by the International Development Innovation Network (IDIN) based at MIT.

- Members of the local community are invited to participate in the process of developing a prototype to solve a local challenge. For instance, at the 2015 “Zero Waste” Summit in Colombia which focused on innovative waste solutions, more than 20 percent of participants were waste pickers; at a summit in Botswana about desert livelihoods, nearly half of the participants at IDDS D’Kar were members of the San tribe; and refugee-camp residents participated in the Rethink Relief summit in Uganda. This engagement ensures that the summit doesn’t just build innovative solutions, but also builds capacity at the local level.

- The impacts continue and grow long after the summit has ended. Participants become members of the IDIN network and as such become eligible to apply for support including funding, educational opportunities, technical support, and business development support. IDIN's network numbers more than 800 members from 65 countries. They are implementing and refining more than 150 innovations reaching an estimated 500,000 people over the past five years.
- IDIN supports the creation of local chapters that sustain projects and share knowledge. Past summit participants have formed chapters in Africa (Botswana, Ghana, Kenya, Tanzania, Uganda, and Zambia), Latin America (Brazil, Colombia, Guatemala, and Peru), and South Asia (India and Pakistan). Local chapters are now independently teaching design trainings, founding new innovation centers, and organizing their own design summits. For example, the IDIN Colombia chapter has sustained four projects from the waste summit, organized a summit on education, and founded the innovation center C-Innova. In Tanzania and Zambia, institutional partners coordinate local chapter activities, support continued outreach and technology transfer in communities that hosted summits, and disburse small grants to local innovators. Chapters recently spearheaded local waste management challenges, organized field trips and learning exchanges, and hosted workshops on market-readiness and customer discovery. IDIN views chapters as a cost-effective and high-impact intervention where members can find technical, business, and motivational support to continue their work and ventures. This organic expansion has brought the collaborative design approach to more people while deepening the impact of innovation in communities. Many IDIN-supported innovation centers offer trainings via "Build-It" curriculum — short, skill-based building modules — and specialized outreach to local schools and community organizations. The centers also serve as community maker-spaces and are providing support to these innovators. For instance, C-Innova in Colombia is supporting a plastic filament extruder for 3D printers and an organic waste-processing machine first prototyped at the "Zero Waste" Summit.

INVENTION SPOTLIGHT

## SOLAR SUITCASE

Haiti, Philippines, Vietnam, Nepal, elsewhere in South Asia and Africa | [blumcenter.berkeley.edu](http://blumcenter.berkeley.edu)

*Connecting maternal health to energy security in developing countries using solar energy*

**SUPPORTED BY**

UC Berkeley Development Impact Lab and the Social Entrepreneurship Accelerator at Duke

**FOUNDERS**

Laura Stachel and Hal Aronson

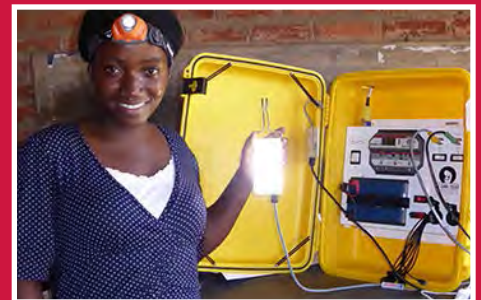


Photo: UC Berkeley



**PROBLEM ADDRESSED**

More than 287,000 women die each year from pregnancy complications, and millions of infants are stillborn or die in the first days of life, primarily in regions with insufficient energy resources for conducting basic obstetric care.



**INNOVATIVE IDEA**

The WE CARE Solar Suitcase is an economical, easy-to-use portable power unit that provides health workers with highly efficient medical lighting and power for mobile communication, computers, and medical devices. By equipping off-grid medical clinics with solar power for urgent medical care, WE CARE Solar reduces illness and death among mothers and infants and improves the quality of care.



**RESULTS**

More than 2400 health centers are now equipped with Solar Suitcases. WE CARE Solar has served an upwards of 900,000 mother-infant pairs and provided over 6.5 million hours of lighting. There are also now more than 1,000 suitcases in over 20 countries. In September 2015, the United Nations in September 2015 awarded a \$1 million grant to expand the use of the device.

# Better Evaluations Find the Right Solutions

*Making good ideas better through evaluations.*

HESN emphasizes finding the right solutions that match the local setting and available resources. HESN Labs therefore place a significant emphasis on better ways of evaluating approaches — in the lab and in the field — in order to identify those that have the best chance of success before investing in widespread implementation.

Evaluation is critical for every actor in the development landscape, from the practitioner designing programs, to the social entrepreneur building a business, to the government official making critical policy decisions. They need evidence that their approach is effective in order to justify additional funding to continue their efforts on a larger scale.

But evaluations take time and money, which startups typically lack. That's especially true in the healthcare field, where evaluation often requires randomized controlled trials. The **Social Entrepreneurship Accelerator at Duke (SEAD)** works with the Duke Global Health Institute's Evidence Lab to create an **evaluation toolkit** health entrepreneurs. This set of easy-to-use tools is designed specifically for innovators to strengthen their impact statements as they relate to patient benefits, economic implications, organizational influence, and expansion. Faculty met with SEAD-supported innovators in India and East Africa in preparation for testing and finalizing the tools in 2016. The toolkit, which is free and publicly available, was released in 2017.

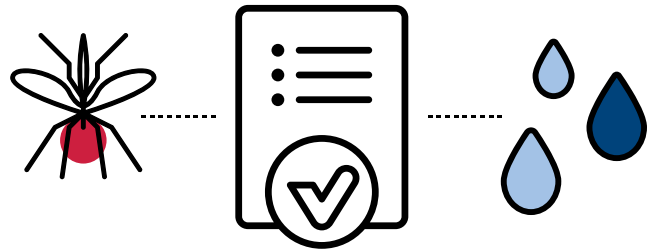


Various photographs from the Social Entrepreneurship Accelerator at Duke (SEAD).

At MIT, the **Comprehensive Initiative on Technology Evaluation (CITE)** was launched with the goal of developing rigorous methods of evaluating solutions so that development organizations can make educated decisions about which products to deploy in low-income communities.

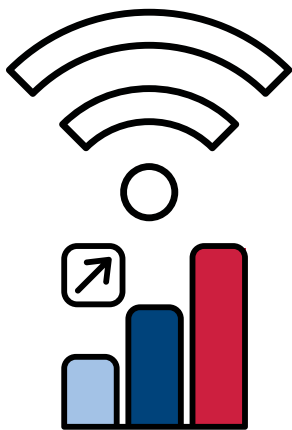
- CITE's evaluation of solar-powered lanterns in Uganda has already been used by small nonprofit organizations to inform their decision-making processes and has been read by more than 2,600 people. CITE also published an evaluation of more than 100 models of household water filters in India shedding new insights into how people in low-resource communities use filters and how innovation could better meet their needs. As a result of the evaluation, MIT is developing a low-cost water filter made out of a tree xylem.

- CITE has produced several more evaluations, including of water-quality test kits in India, rapid diagnostic tests for malaria in Uganda, educational technology in India, and crop storage to prevent post-harvest loss for small farmers in Uganda.



- Ongoing evaluations are assessing solar water pumps for irrigation, wheelchairs in low-resource settings, chemical-free methods to minimize spoilage and pests in emergency food aid, and vegetable cooling technologies in Mali.
- CITE is also creating an open online course for professionals to teach this method of evaluating products designed for the developing world to a broader audience which launched in Spring 2017.

At the College of William & Mary, the **AidData Center for Development Policy** pioneered a new high-tech method to evaluate the effectiveness of development programs: **geospatial impact evaluation** (GIE). By mapping the locations of aid projects and using the rapidly growing supply of available satellite, household and census surveys, and administrative data on diverse development outcomes, this method makes it possible to rigorously evaluate program impact in less time and for less money than full-scale randomized control trials (RCTs) - and in cases where implementing an RCT would not be possible. For example, GIE enables rigorous evaluation when it is not feasible or ethical to randomly select which stakeholders receive an intervention development (as required in RCTs). The use of remotely collected data allows for the evaluation of programs in conflict areas, where it may be extremely expensive or infeasible to collect data from project sites. AidData is currently conducting geospatial impact evaluations of USAID-supported projects focused on strengthening regional governance in conflict-affected parts of Colombia, building infrastructure in West Bank and Gaza, supporting employment in Afghanistan, and improving government responsiveness in Niger.



The **Development Impact Lab** (DIL) based at UC-Berkeley is testing new ways to evaluate the impact of development projects remotely and efficiently. Traditional surveys are often inaccurate because respondents try to give the desired answers. Such inaccuracy can be deadly — for example, when the evaluation is trying to gauge the safety of water or indoor air. Mechanical sensors cut past that variable. In 2015, a DIL team led by Portland State University worked with the government of Rwanda to place sensors in 150 villages to monitor water filters and cooking stoves. By moving the sensors each month, the study can gauge health conditions for 470,000 people.

More than half of DIL-funded projects use wireless measurement technologies to track performance of development interventions. The vision is that governments will focus on performance and on the “delivery of services that actually improve people’s health, their security, and their workforce readiness and education,” DIL Managing Director Temina Madon said. “We need a way to identify the highest performing programs—and that’s where rigorous evaluation is needed.”

- DIL shares an open-source toolkit for assessing the impact of development projects at [cega.berkeley.edu/tools](http://cega.berkeley.edu/tools).
- DIL is creating an online platform where researchers and practitioners can upload data from remote sensors or via mobile phone using University of Washington’s Open Data Kit and Portland State University’s SWEETSense remote monitoring systems.



# Interdisciplinarity

## *Building bridges between disciplines.*

While academics are sometimes perceived as speaking exclusively to their fellow specialists within the same field or discipline, HESN encourages **interdisciplinary and multidisciplinary approaches**, creating partnerships among experts from diverse fields. At universities with HESN Development Labs, faculty members say HESN has increased the number of interdisciplinary collaborations focused on development by creating incentives for cooperation on a clearly identified set of challenges and research opportunities. Experts in higher education and development innovation say HESN has been successful in creating the resources — including funding, institutional recognition, a support structure, opportunities for publishable research, and partnerships with USAID and other prominent development institutions — needed by faculty, postdoctoral researchers, and graduate students to support the expansion of development research. Campus leaders credit HESN with bringing a stronger international perspective to participating departments and greater attention to international development across campus.

These partnerships engage undergraduate and graduate students, faculty, and staff across fields such as engineering, entrepreneurship, business, agriculture, law, design, biology, medicine, anthropology, economics, and public health to apply their expertise and enthusiasm to development challenges. HESN engages disciplines not traditionally involved in international development and invites them into collaborations to address challenges. For example, to combat vitamin deficiency in Tanzania while strengthening livelihoods for female farmers, the Global Center for Food Systems Innovation at Michigan State University supported a project exploring market opportunities for vitamin-fortified sweet potatoes. To help entrepreneurs manage and process the crops, write business plans and obtain capital — even establish community banks and cooperatives — the project has called upon nutritionists, food technologists, crop scientists, biotechnologists, agri-business economists, gender specialists, and entrepreneurship specialists.

“Each morning before beginning construction on our prototype, we would lay out our tools and materials. We were quite limited in what we had access to so we were challenged to think creatively to come up with cheap solution to a problem that currently only has very expensive solutions.” - Travis Bumgarner, IDIN Participant



PHOTO: TRAVIS BUMGARNER, IDIN

In another example, the ResilientAfrica Network based at Makerere University in Uganda, engaged a team of engineers called the Innovation Consortium Limited who offered mentoring to students and faculty on the design and construction of their prototype inventions and ideas. This collaboration spawned monthly “Innovation Garage” events, starting from an engineering perspective but open to all disciplines. The events have drawn participants from disciplines such as information technology, computer science, architecture, and even psychology, and the new mentors have provided useful feedback on the prototypes. RAN recognizes the importance of both the technical and societal aspects of new innovations. Given the success of the Innovation Garages in providing mentoring to innovators, RAN added a recurring “Social Design Clinic” offering mentoring from experts in the social and behavioral sciences and a “Resilient Communities Legal Cafe” to provide innovators with technical assistance concerning legal questions. RAN collaborates closely with Stanford’s ChangeLabs to infuse human-centered design into innovator trainings and other initiatives, such as Deliberative Polling.

HESN Labs were interdisciplinary from their creation, and their work has created many interdisciplinary projects. *A few examples:*

At MIT, the Comprehensive Initiative on Technology Evaluation (CITE) has created a multidisciplinary network of faculty, staff, and students focused on the impact of technology in development. CITE gathers MIT experts in **engineering, international development, urban planning, business management, supply chains, public policy, public service, and people’s interactions with technology.**

At MIT’s International Development Innovation Network (IDIN), a cross-disciplinary collaboration is at the heart of the lab’s approach to designing solutions — convening diverse perspectives to solve problems. IDIN holds design summits around the world inviting participants from varied backgrounds including **waste management, healthcare, agriculture, clean energy, education, engineering, and industrial design.** IDIN calls upon diverse experts from its partner institutions in other fields such as **design, energy, cross-cultural dialogue, anthropology, supply chain management, and business development** to provide mentoring for innovators who have received microgrants and scale-up fellowships. An equally important aspect of diversity is socioeconomic and educational diversity, allowing participants from different walks of life to bring their unique experiences to the table.

The ResilientAfrica Network (RAN), based at Makerere University, initiated collaboration among units in **public health, engineering, design, art, social sciences, biostatistics, and technology** — among other disciplines. Makerere leaders say that collaboration expanded the community’s vision of innovation to encompass new technologies, best practices, and approaches. RAN partners with George Washington University’s Initiative for Disaster Resilience and Humanitarian Affairs within the Elliott School for International Affairs. RAN brings in experts from more fields for its Collaborative Resilience Innovation Design workshops: For instance, RAN’s Horn of Africa Resilience Innovation Lab in Ethiopia invited experts in **veterinary medicine, water engineering, agri-business, and micro-entrepreneurship** to offer feedback on possible interventions in water resource management and livestock production.

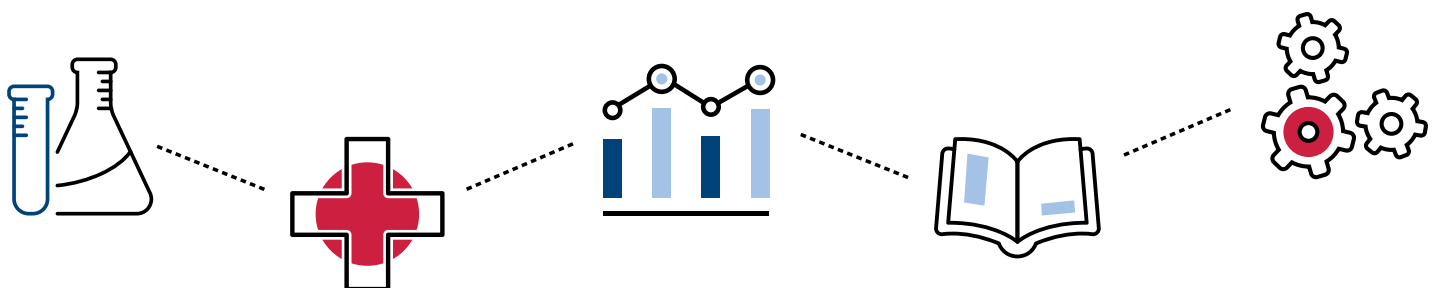




PHOTO: DANIEL WILSON, DIL

Each year, 4 million people die from inhaling cooking smoke, making exposure to cooking smoke today's greatest environmental health risk. HESN is working to solve the crisis by working with communities to design and evaluate cleaner-burning cookstoves.

The Development Impact Lab (DIL) was born out of a collaboration between UC Berkeley's Center for Effective Global Action and the Blum Center for Developing Economies. One of DIL's signature accomplishments is the creation of an interdisciplinary field of research, **Development Engineering** — the study of technology intervention design as a way to improve human and economic development in complex and low-resource settings. The approach to design is now a minor for Ph.D students in engineering, natural sciences, and social sciences: the classes have drawn students from other disciplines such as economics, social welfare, and public health. DIL also designs its grant competitions to encourage interdisciplinary work: research teams with members from multiple disciplines are more likely to receive funding.

Duke University's Social Entrepreneurship Accelerator at Duke (SEAD) brings together units in Duke's schools of business (**the Center for the Advancement of Social Entrepreneurship**), medicine (**Innovations in Healthcare**), global health (**Duke Global Health Institute**), and engineering (**Developing World Healthcare Technology**), in partnership with social investors (**Investors' Circle**). Duke leaders say SEAD's work has strengthened the university's ability to collaborate across disciplines. SEAD's research grants have engaged faculty from **biomedical engineering, medicine, nursing, economics, public policy, and global health**. For example, when an engineering professor developed an advance in cervical cancer screening, SEAD connected her with innovators, provided strategic guidance, and introduced her to a major health technology firm.

The Global Center for Food Systems Innovation (GCFSI) is a collaboration among Michigan State University's colleges of **communications arts and sciences, agriculture and natural resources, education, social science, engineering, and the offices of international studies and research**. Additionally GCFSI works with departments concerned with **resource economics, community sustainability, packaging, and microbial sciences**. Recognizing that each field has specialized terms and concepts, and in order to promote communication between disciplines, GCFSI created a student project to "translate" research across disciplines: The Translational Scholars Corps. The students are trained in innovative storytelling and have produced dozens of articles, videos, and podcasts, as well as provided workshops to help researchers better communicate their findings.

The Center on Conflict and Development (ConDev) is a partnership among Texas A&M University's College of **Agriculture and Life Sciences**, Bush School of **Government and Public Service**, College of **Liberal Arts**, and **School of Public Health**. ConDev's activities engender cross-disciplinary work such as the Aggies Invent competition, which invites students from all disciplines to develop a prototype in 48 hours or less. In an effort to devise a non-lethal means of keeping elephants out of crops, ConDev held a Human-Elephant Conflict Workshop in Botswana in June 2016. This event brought Texas A&M and MIT students to collaborate with University of Botswana students and community members in the country's Okavango Delta. Together, they used their combined expertise in engineering, conservation, and farming to develop actionable prototypes. "I love the use of interdisciplinary problem-solving, and I think that's when you come up with exceptionally novel concepts," said ConDev's Dr. Leslie Ruyle. "I think the combination of everyone's skill sets and thought processes is when you come up with the greatest solutions."

The **AidData Center for Development Policy at the College of William & Mary** convened 120 scholars across 50 different universities to partake in the global AidData Research Consortium (ARC). By breaking down the traditional disciplinary barriers that often prevent collaboration among the diverse disciplines represented in the ARC - including **economics, geography, computer science, epidemiology, political science, and many others**- the ARC has successfully fostered innovation in the use of geospatial data for development research. A notable innovation incubated by the ARC is AidData's Geospatial Impact Evaluation methodology (GIE) which brings together geospatial data on development investments and outcomes to expand the applicability and accessibility of rigorous evaluation. The GIE methodology was developed by three ARC researchers - **a Political Scientist, a Geospatial Scientist, and an Environmental Scientist** - who brought together political science's expertise in randomized evaluation with geospatial analysis and remote sensing skills to create a GIE methodology that now evaluates a USAID/Ecuador fisheries program. Since this initial pilot, the AidData Center's partnership with USAID has enabled the refining and scaling of this methodology, such as the creation of its geo(query) tool to reduce the barriers to processing and merging vast quantities of geospatial data for researchers across disciplines.

INVENTION SPOTLIGHT

**RootIO**

Uganda | ranlab.org

*A civic media project that leverages technology to support peer-oriented radio networks*



Photo: ResilientAfrica Network

**SUPPORTED BY**  
ResilientAfrica Network

**FOUNDERS**  
Jude Mukundane and Chris Csikszentmihalyi



**PROBLEM ADDRESSED**

In many countries in Africa and South Asia, fewer than 25 percent of adults have Internet access. But 75 percent or more of households in developing countries have access to radio. In communities with poor infrastructure and communication, local radio remains an effective way to share important information and build community across distances.



**INNOVATIVE IDEA**

A basic radio station is too costly for most low-income communities. RootIO cuts that cost in half with mobile technology and renewable energy. Instead of a studio, hosts conduct their shows via mobile phone. The transmitter is connected to another mobile phone, placed in a waterproof bucket, and connected to an antenna and solar panel. Innovators at the ResilientAfrica Network are working to lower costs further.



**RESULTS**

In the first four Ugandan communities with RootIO stations, call-in shows on agriculture advice and public health have become popular. Farmers have used the stations to obtain market information and locate lost livestock. A secondary school reported increased enrollment after airing advertising. The second phase will include 12 additional stations, covering areas in the Elgon highlands and parts of the Teso region.

# FOSTERING COLLABORATION

HESN supports the U.S. Global Development Lab's mission to accelerate the transformation of the development enterprise by opening development to people everywhere with good ideas. Participants in the program say HESN has expanded universities' ability to interact with the international development community, especially through USAID Missions and Bureaus.

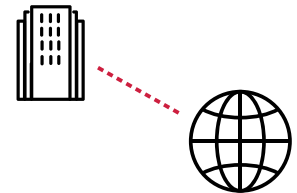
To quantify how HESN activities have involved a broad range of practitioners in the work of innovative collaboration:



An estimated 20,000 people have participated in **hubs, summits, and other problem-solving events** created with HESN resources.



More than 4,200 participants participated in **crowdsourcing and open challenges** created by HESN Labs.\*



HESN Labs have undertaken collaborations with **over 70 USAID Missions (country offices), Bureaus, and Offices.**



HESN Labs have created 89 **collaborative platforms** through which development professionals can work together in person or electronically.



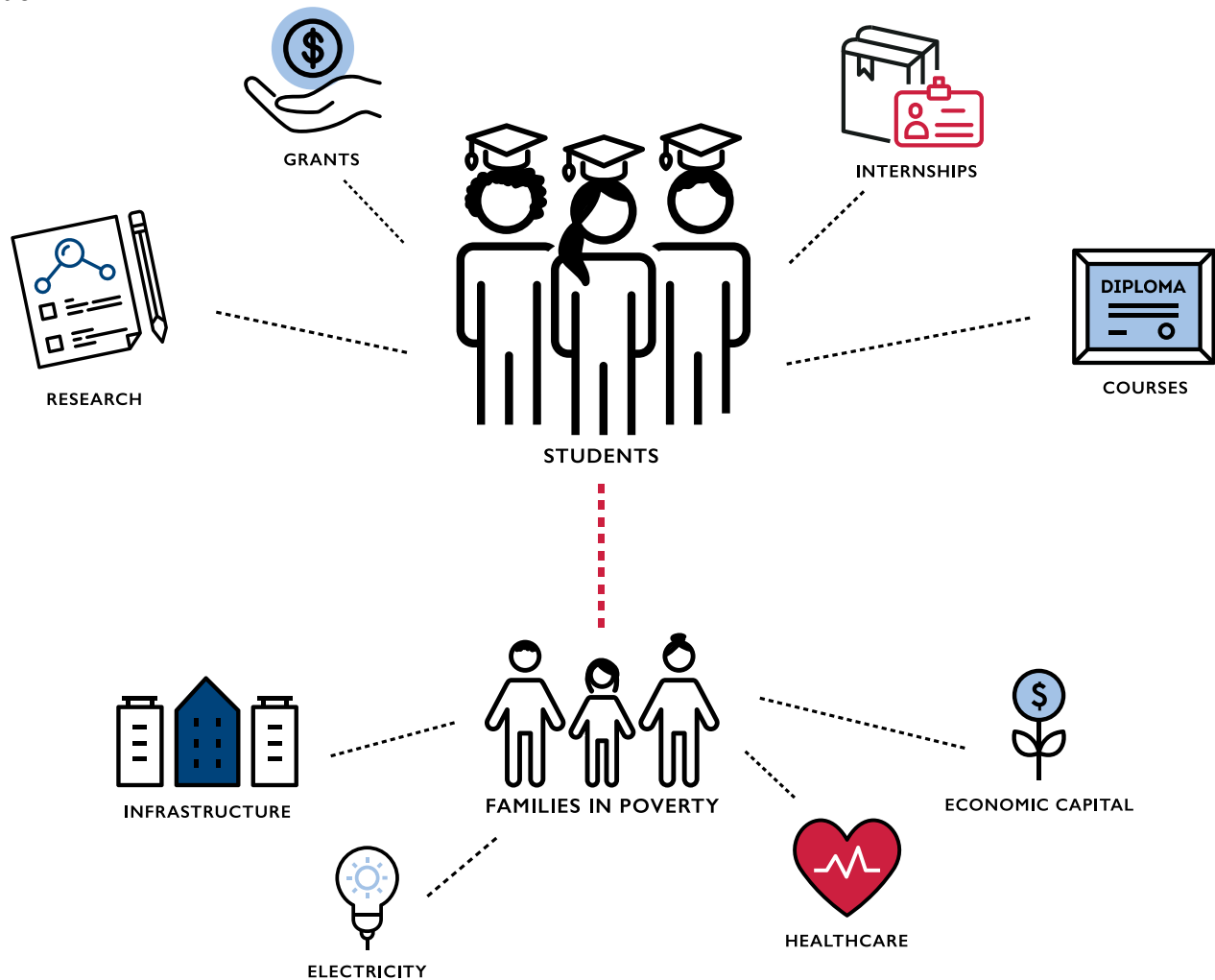
HESN knowledge-sharing platforms logged over **1.3 million visits.**

*\*All totals are as of late 2016 except this bullet, which is as of mid-2015.*

# Student Engagement

*Engaging students in research experience and development innovation.*

USAID-supported HESN Labs have increased academic offerings and research opportunities for undergraduate and graduate students, while increasing students' awareness of the role of science and research in improving conditions for people living in poverty. Through research grants, fellowships, internships, and experience in class and in the field, HESN has given students direct experience at the intersection of research and development innovation.



## New classes and concentrations

USAID funding through HESN has led to large increases in new classes, research fellowships, and field-based internships related to international development. This funding has supported 214 classes and disciplines, impacting more than 4,000 students by late 2016. *To name a few:*

- At Duke University, a member of the Social Entrepreneurship Accelerator at Duke (SEAD) team developed and launched courses on social innovation and social entrepreneurship for the graduate and undergraduate levels. Global health master's students have devoted their thesis research to informing SEAD innovator projects in developing countries such as the care preferences of diabetes patients in rural India; SEAD staff helped them design their research surveys. Master of Business Administration students have engaged on consulting projects with the global health entrepreneurs in the SEAD program through a consulting practicum and class projects.

- At the College of William & Mary, HESN support helped AidData create data science courses that are now taken by over 12 percent of the freshmen class annually and cover a broad set of skills related to the collection, processing, visualization, and analysis of data.
- At the USAID funded through HESN ResilientAfrica Network, Makerere University in Uganda and George Washington University cooperatively a course on resilience - the study of communities recovering from disasters and other shocks. The course is now offered online and in-person at Makerere University College of Health Sciences and School of Public Health.

USAID's support through HESN has spurred new academic programs such as a concentration in conflict and development at Texas A&M; a master's in development, Ph.D. concentration in development engineering, and certificate in information and communications technology for development at UC Berkeley; and a core data science curriculum and a new international development Masters of Public Policy track at William & Mary. HESN Labs have also reached out to other instructors in relevant disciplines to provide examples from active HESN projects for discussion in class. For example, students in a Duke Law School course on health policy conducted projects with MedcallHome, which provides health advice by phone in Mexico, and BasicNeeds, a community-oriented approach to helping low-income, mentally ill people in Africa and Asia.

## INVENTION SPOTLIGHT

### RISE LEGS

India, expansion plans for Africa and South America | [idin.org](http://idin.org)

*Lightweight prosthetic legs made from naturally grown cane that help amputees walk, run, and dance.*

#### SUPPORTED BY

MIT International Development Innovation Network (IDIN)

#### FOUNDER

Arun Cherian



Photo: Rise Legs



#### PROBLEM ADDRESSED

Prosthetic legs in developing countries are often cumbersome or expensive. In India, amputees can obtain prosthetic legs that are free, but they are typically heavy, difficult to use, and ill-fitting. Better prosthetics are financially out of reach for the poor, leaving them struggling with livelihood and well-being.



#### INNOVATIVE IDEA

Rattan cane is grown in Indian forests and has a flexible, yet light and sturdy structure that is well-suited for prosthetic legs, and provides a bounce that aids walking. Local knowledge is available from artisans who bend the cane into furniture. Arun Cherian, founder of Rise Legs, tested the material at the Indian Institute of Science and asked volunteers to try prototypes. Having participated in an IDIN summit, he was able to apply for technical assistance from a team of students in the MIT D-Lab's Design for Scale class and a Scale-Ups Fellowship from IDIN to provide funding and mentoring.



#### RESULTS

Users say the device has given them back a part of their lives they thought they had lost. One user said he previously could only wear his heavy, free prosthetic for three hours a day, but that he could wear the Rise Legs model for 13 hours, work longer, and generate more income. A woman who used to dance professionally before losing a leg below the knee began training to dance again with the Rise Legs prosthetic. Rise Legs is now designing lines for dance and sports. The project has received sponsorship and support from the International Red Cross. So far, nearly 50 prosthetics have been fitted and 2 clinical trials are underway. They are also working towards ISO testing.



MIT IDIN in Tanzania with local villagers and farmers.

### Awareness and competitions

HESN Labs are increasing students' understanding of the role that science and research can play in improving quality of life in low-income communities. A big part of that awareness-raising comes from popular competitions that reach across campus and even to multiple universities. The fun formats, combined with the incentives of recognition and financial support, brings out students' energy and creativity.

- HESN has expanded UC Berkeley's popular *Big Ideas* contest, in which students receive mentoring to flesh out promising concepts, culminating in a "Pitch Day" with finalists publicly making the case for their projects. USAID funding through HESN support allowed UC Berkeley to add three competition categories — related to global health, food supply innovation, and the use of mobile technology for literacy — open to all HESN-affiliated universities.
- At the Social Entrepreneurship Accelerator at Duke, the format of the SEAD Case Competition provides intensive brainstorming to one selected innovator from a developing country. The innovator's case is presented to student teams, who have three days to produce recommendations. In 2016, teams tried to produce the best marketing plan for a mobile phone app that helps Kenyans pay for healthcare, Changamka Microhealth. SEAD also holds competitions themed on pressing public health issues such as Ebola and the Zika virus.
- HESN partners Texas A&M, William & Mary, and University of Texas at Austin each staged competitions inspired by the television show "Shark Tank," in which entrepreneurs pitch their ideas before a panel of "sharks," or experts. One of William & Mary's winning teams developed a better way to track funding to Liberia at the height of the Ebola response, which revealed that 33 percent of total aid had previously been unreported. AidData is now working with USAID to adapt this method to inform Ebola recovery efforts in Sierra Leone.
- Texas A&M's Center on Conflict and Development (ConDev) sponsored "Aggies Invent," an intense, 48-hour, interdisciplinary competition that enabled students to design and prototype interventions to help communities prepare for, mitigate, and recover from conflict. Of almost 200 applicants, 50 students made the cut and were mentored by 14 experts from Botswana, Canada, the Democratic Republic of the Congo, Ghana, Guatemala, and Senegal.



## Students pursue research through grants and fellowships

USAID's support through HESN has provided the participating universities with increased funding for student projects and field work. At Texas A&M's Conflict and Development Center, the Student Media Grant Program has enabled student photographers and filmmakers to travel in order to document, through multiple media, communities facing conflict. Winners from Texas A&M and other universities have documented challenges ranging from malnutrition in Guatemala and land use in Peru to resource conflict between people and animals in Bangladesh and people fleeing the Boko Haram militia in Nigeria. At UC Berkeley, DIL has competed out small "explore" grants to students to support early-stage, exploratory research that combines technology innovation with social and economic research to solve development challenges, through research, fact-finding, or new partnerships.

New student opportunities through HESN Labs related to international development include fellowships, which fund students to carry out their research projects with guidance from faculty. More than 500 U.S. students have served as fellows in developing countries for more than one month via HESN Labs as of late 2016. Often, students' research yields information valuable to innovative projects by entrepreneurs in developing countries that are also supported by HESN. In this way, student learning contributes to advancing projects. For example, through the International Development Innovation Network (IDIN), D-Lab students traveled to Tanzania to support an IDIN Network member to develop Avomeru, a social venture that helps small-scale farmers produce avocado oil to sell on regional markets. IDIN's Summer Research Fellows conduct exploratory research on local innovation processes and ecosystems in numerous countries. The AidData Center's Summer Fellows program trains governments, non-governmental organizations, and universities to improve their use and application of geospatial development data. The Fellows' impact includes developing a GIS curriculum at Kathmandu University, incorporating geospatial analysis in the Government of the Philippines' disaster preparedness audit for the first time, and supporting the creation of a GIS unit in Ghana's National Development Planning Commission (NDPC).

Focus group discussion with Sunaula Hariyali (Fresh Vegetables) Farmers' Group.



PHOTO: VANESSA M. TAYLOR, DIL

## Experience in the field

USAID's support through HESN has supported faculty in offering field-based classes in conjunction with partners in developing countries in order to expose students to on-the-ground development innovation work and meaningful collaboration. A field-based "practicum" lets students participate in the practical application of concepts and theories. More than 8,000 students have participated in short-term practica or other field experiences through human, financial, or institutional resources provided by HESN Labs. Students say the field-based experiences have been critical in setting the direction for their future work.

For example, Texas A&M has offered field-based classes in Benin about voters' view of legislators; in the Democratic Republic of Congo about child nutrition and youth education; and in Ghana on youth employment. At MIT, IDIN reaches inventors around the world who participate in design summits and become network members; MIT students in turn provide assistance to those inventors — in engineering, research, and business. Through the class "D-Lab: Design for Scale," MIT students partnered with MoSan, a dry-separation toilet and sanitation system, to help support a re-design of the toilet hardware and analyze production costs. The students and inventors "came up with detailed designs...renderings, and a full list of specific parts that need to go into the project. By the time we left, we had built from scratch a full design...and had a clear vision for where the project should progress," student McCall Huston wrote. "It was both very fun and exciting to explore a new country while at the same time fulfilling to know that we were able to contribute to a project that can significantly improve people's lives."

## INVENTION SPOTLIGHT

# MODIFIED ATMOSPHERE PACKAGING

Guatemala | [condev.org/map-ts](http://condev.org/map-ts)

*A specialized plastic bag that controls the diffusion of gases and optimizes food storage is increasing livelihoods for women in farming communities.*

### SUPPORTED BY

The Center on Conflict and Development at Texas A&M University

### PARTNERS

Conflict and Development Foundation and Asociación de Desarrollo Integral Pueblos Hermanos



Photo: The Center on Conflict and Development at Texas A&M University



### PROBLEM ADDRESSED

High unemployment and low education leave women in rural Guatemala economically and socially vulnerable. Agriculture for export holds high potential for supporting livelihoods, but is limited by the cost of preserving products during shipping. Technologies exist to address these issues, but are not well-known or integrated into business plans.



### INNOVATIVE IDEA

In the packaging technique known as Modified Atmosphere Packaging (MAP), the air inside a bag is replaced with a mix of gases that preserves the freshness of agricultural products. The technique is affordable for low-income farmers. Longer-lasting produce means the farmers can ship their goods to new profitable markets, and more income for women farmers means more decision-making power in the home. ConDev trained women in rural Guatemala to use this technology and integrated the packaging into local food processing centers.



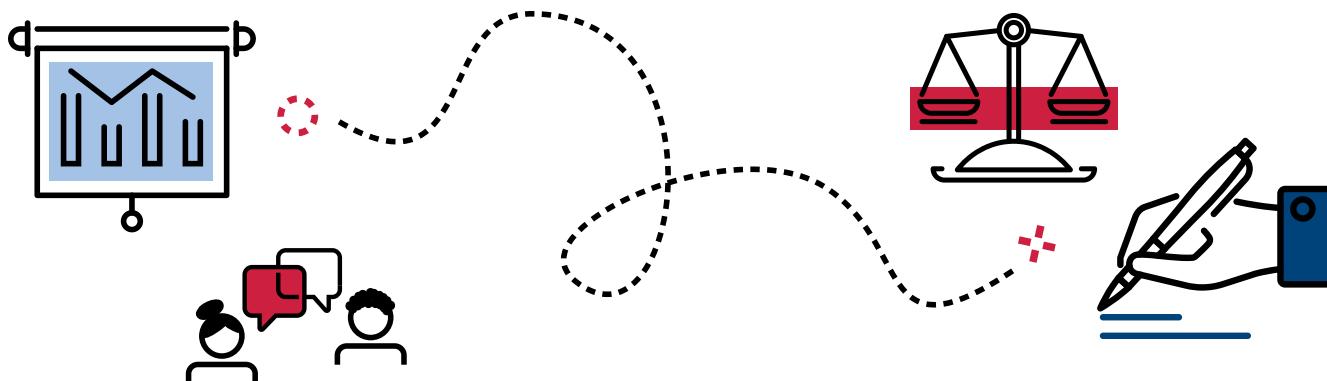
### RESULTS

The shelf life for most vegetables extended 3 to 4 weeks, while produce waste decreased by 25 percent. After ConDev's intervention, employment rose 15 percent in the vegetable packing centers in Guatemala that used the technology. Because the specialized bags are more efficient for packing, women reported they packed more produce, and their income doubled.

# Policy Impact

*Research shapes policy as HESN Labs bring data to decision-makers.*

HESN Labs conduct research and develop technologies that help policymakers make better decisions. HESN activities have shaped many changes in policies and programs by development institutions.



Faculty and students at HESN-affiliated universities engage in “action research” — targeted research intended to solve a particular problem — on the ground in developing countries to bring problems to the attention of key policymakers. Their research findings have inspired officials to take action, improving conditions for populations in need.

- The Development Impact Lab (DIL) based at UC Berkeley sent an interdisciplinary research group to visit rural communities in Kenya that lacked electrical power to measure their need and estimate the potential benefits if they were connected to the grid. To the surprise of the members of the group, they could not identify many communities that were truly “off-grid.” As a result, the group shifted its focus to populations who were “under grid”—in other words, people whose homes and businesses were near, but not directly connected to, the grid network. As a test, the researchers connected nearly 500 households to the national grid at lower rates. In May 2015, the Kenyan government pointed to DIL’s data when it announced it would subsidize extending the electrical grid to 600,000 low-income customers in more than 5,000 communities.
- The ResilientAfrica Network (RAN) used the “Deliberative Polling” method to empower community members in Uganda, Ghana, Senegal, and Malawi to join in deep dialogues about the risks of environmental challenges and rapid urbanization. RAN presented the results to the community, parliamentarians, ministers, and other policymakers in Uganda. The reaction was clear policy action. Government officials learned that community members were reluctant to plant trees for fear the government would seize ownership; in response, local and national officials initiated a program to provide tree seedlings to the communities to encourage planting. Further, as they deliberated, community members became more convinced of the importance of increasing funds for local disaster management; in response, government officials placed disaster funds under the control of district-level officials rather than the central level. Officials said the experience made them understand the value of a bottom-up approach to policy formulation.



PHOTO: RAN

The Deliberative Polling (DP) Approach is a citizen-based data generation method that seeks to contribute to the process of developing interventions that respond to the felt needs of the community.

- Michigan State's Global Center for Food Systems Innovation (GCFSI) sent students to Lilongwe, Malawi, for two weeks to interview vendors in open-air produce markets about their challenges in earning a livelihood. Vendors said inadequate sanitation makes it difficult for them to provide clean food and a safe working environment, while poor lighting makes the market unsafe at night. Students presented their findings to local government officials along with potential solutions. As a direct result, the Lilongwe City Council earmarked 25 percent of market revenue fees to improve the markets' structures such as providing washrooms, storage, and locks. "As a Council, we are very grateful to the students," Council official Genscher M'bwabwa said. "The policy briefs produced by the students were very brilliant and exposed the Council's shortcomings."

**HESN Labs improve development decision-making by improving data quality, access, and analytics.** Better ways to display data and citizens' opinions are strengthening policymakers' decision processes and inspiring them to be transparent to the public.

- At the College of William & Mary, the mission of the AidData Center for Development Policy is to enable practitioners around the world to use geospatial data to better allocate, coordinate, and evaluate international development interventions. The AidData Center has worked with 11 different developing country governments (Bangladesh, DRC, Ghana, Haiti, Honduras, Nepal, Niger, the Philippines, Senegal, Uganda, and Timor-Leste) to map all known bilateral and multilateral aid projects in these countries. For 6 countries, partnering with AidData inspired openness, as they agreed to make their

aid information available to the public for the first time. AidData promotes the use of this data for policy-making by training more than 1,650 development professionals in the use of geocoded aid information and developing a user-friendly GIS portal that is customized to meet the analysis needs of their partners in each country. In Nepal, these efforts enabled the Ministry of Finance to use their Aid Management Platform (AMP) GIS Portal to identify that the impoverished Far Western region was significantly underfunded and that the fragmentation of aid efforts into many small projects was creating high administrative costs for the government. Based upon these findings, the Government of Nepal established a Development Cooperation Policy in 2014 to address the challenges identified by the data.

- The AidData Center supports research in many countries exploring how and why access to data affects government programs and policymakers' decisions. For example, an impact evaluation in 572 Indonesian villages demonstrated that "leakage" in a large-scale, rice subsidy program was reduced by 26 percent when intended beneficiaries had access to more information about their rights. Another AidData-commissioned study demonstrated that increasing the transparency of resource allocation decisions incentivized local officials in Malawi to allocate resources where they are most needed, rather than where they stood to gain the largest political benefits.
- The Collective Assessment and Feedback Engine (CAFÉ) is an online platform that asks citizens their positions on issues, then displays visually how other community members feel. UC Berkeley's Development Impact Lab used CAFÉ in Mexico to let citizens rate the government's performance and state what issues the government should prioritize. DIL brought the responses directly to incumbent and newly elected leaders: Citizens said the government should do more to alleviate the causes of corruption, strengthen public safety, and improve education. In Uganda, a nonprofit organization that provides maternal health services changed its training system after receiving insights through CAFÉ, adding training sites for trainees' convenience, while including men in family planning trainings as women had urged.

## INVENTION SPOTLIGHT

# NOORA HEALTH

India | [noorahealth.org](http://noorahealth.org)

*Noora Health is reducing the readmission rates of heart surgery patients by 22 percent by educating patient families on tools for recovery.*

### SUPPORTED BY

Social Entrepreneurship Accelerator at Duke

### FOUNDERS

Katy Ashe, Edith Elliott, Shahed Alam, Jessie Liu



Photo: Noora Health



### PROBLEM ADDRESSED

When cardiac patients are released from hospitals in some communities, they return to villages with little knowledge about the recovery process and no access to doctors or nurses. As a result, patients have a high rate of complications and readmission.



### INNOVATIVE IDEA

Using interactive skill-based learning, Noora Health teaches family members how to coach basic physical therapy, encourage proper dietary/lifestyle changes, improve health conditions for their families, and detect early warning signs of medical emergencies.



### RESULTS

In its first two years, complications declined by 36 percent; readmission declined 22 percent. Eighty-nine percent of caregivers trained by Noora Health said they felt more confident in their ability to care for their loved ones.



Through action research at urban food markets and collaborative activities with food retailers, students in GCFSI's Frugal Innovation Practicum (FIP) learn about challenges associated with food security, urban food systems, and food-based livelihoods.

**HESN is helping USAID up its game.** HESN is taking action research into the field with a direct impact on the way the U.S. government plans and adjusts aid projects. HESN Labs have partnered closely with USAID to help the agency and its country offices increase their use of data analysis. By 2016, HESN Labs were engaged in collaborative activities with over 70 USAID Missions (country offices), Bureaus, and Offices. USAID staff say working with HESN Labs increased the base of research that they used for decision-making while providing them with new approaches for analysis.

- By late 2016, with HESN's assistance, 37 USAID Missions and Bureaus were using geographic analysis to design, implement, monitor, and evaluate development projects.
- USAID leveraged HESN data to advocate for more funding for the prevention of and response to school-related gender-based violence. Violence in schools is widespread and affects girls disproportionately, but little research had been done on the extent and harm of school violence in developing countries. USAID asked the Center on Conflict and Development (ConDev) at Texas A&M to fill that gap. ConDev examined school violence in Botswana, Ghana and South Africa and showed that bullying lowers victims' academic performance more than other factors such as teachers' experience and the parents' education level. USAID incorporated the findings into a report submitted to the United Nations General Assembly in September 2016.
- At the request of the Director of the Agriculture Office at the USAID Mission in Kabul, ConDev provided analysis on options the Government of Afghanistan could cost-effectively undertake to facilitate a strategic grain reserve.
- SEAD shares its learning about the value of peer groups in entrepreneurship, and the factors for success in creating engaging peer groups and peer learnings to advance small and growing businesses. SEAD has taken these learnings and distilled them into lessons learned for other entrepreneurs through the Smart Impact Capital toolkit. They've also shared this information with the U.S. Global Development Lab, who is currently working on a way to integrate SEAD's learning about peer groups into its work.

**HESN Labs are a convening force** that bring together high-level policymakers from many sectors and levels of development assistance. For example, in late 2015, RAN hosted the “Uganda Resilience Dialogue,” gathering representatives from United Nations agencies, Uganda’s national government, local government, the European Union, and international nongovernmental organizations to coordinate on helping low-income communities increase their “resilience” — to reduce their vulnerability to climate change, natural disasters, inadequate infrastructure, and exploitative trade in natural resources. The policymakers agreed that community members, who are informed by real-time local knowledge, must be involved in proposing solutions. As a result, community members are now heavily involved in proposing solutions to address the different community challenges where they live, tapping into local knowledge. Community sensitization sessions have continued to benefit the communities in need. And the participants agreed that the field of resilience planning itself needs better recognition. “It is about addressing climate and disaster risk across all areas of our work, recognizing that other actions across the development spectrum, including in governance and poverty eradication, contribute to this process,” said Patience Alidri of the United Nations Development Program. In addition to the continuous discussions within the key ministries/development partners, the RAN team has since adopted an approach of physically engaging with these partners to showcase innovations at work and share the community voices.

The policymakers agreed that community members, who are informed by real-time local knowledge, must be involved in proposing solutions. As a result, community members are now heavily involved in proposing solutions to address the different community challenges where they live, tapping into local knowledge. Community sensitization sessions have continued to benefit the communities in need. And the participants agreed that the field of resilience planning itself needs better recognition. “It is about addressing climate and disaster risk across all areas of our work, recognizing that other actions across the development spectrum, including in governance and poverty eradication, contribute to this process,” said Alidri of the United Nations Development Program. In addition to the continuous discussions within the key ministries/development partners, the RAN team has since adopted an approach of engaging in-person with these partners to showcase innovations at work and share the community voices.

## INVENTION SPOTLIGHT

# SANIVATION

Kenya | [bigideas.berkeley.edu](http://bigideas.berkeley.edu)

*Indoor sanitation that also provides an energy benefit*

### SUPPORTED BY

UC Berkeley Development Impact Lab

### FOUNDERS

Andrew Foote and Emily Woods



Photo: UC Berkeley



### PROBLEM ADDRESSED

Globally, 2.4 billion people lack access to sanitation facilities. In Kenya, only 41 percent have sanitation, and only 5 percent of human waste is safely treated before being released into the environment. At the same time, energy costs in Kenya have increased fivefold in a decade, with families in some places spending almost a third of their income on cooking fuel.



### INNOVATIVE IDEA

In urbanizing communities, Sanivation installs modern container-based toilets in people’s homes for free, charging a small monthly fee to service them. Instead of dumping the waste, they transform it into a clean-burning alternative to charcoal. These fuel briquettes produce less smoke than traditional charcoal, reducing indoor air pollution and exposure to toxic fumes. The UC Berkeley student team *Feces to Fuel* is helping Sanivation improve the briquettes’ energy efficiency.



### RESULTS

The fuel saves money for users, reduces CO<sub>2</sub> emissions, and saves 88 trees per ton used. The toilet service prevents contamination of local water sources. UC Berkeley researchers are working with Sanivation to scale-up waste treatment and bring improved sanitation to one million people in five years, including in refugee camps throughout East Africa.

# CAPACITY-BUILDING

Development problems are complex. Equipping a set of emerging trainees with multidisciplinary, field-based perspectives is a necessary part of efficiently addressing complex problems.

***“USAID support of government institutions in dollars only is not sustainable. When you support universities, you teach people to fish. You are creating capacity that is far beyond what you ever imagine.” — Campus leader***

While HESN drives research and innovation, its projects also increase the skills and capability of the people involved in the work.



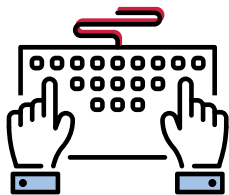
USAID funding through HESN has supported 257 **classes and disciplines.**



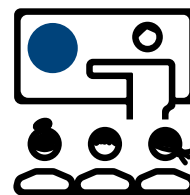
545 U.S. students have completed **fellowships** in developing countries of longer than a month via HESN Labs as of late 2016.



More than 9,684 short-term **field practicum opportunities** or other field experiences have been provided through human, financial, or institutional resources contributed by HESN Labs.



2,077 development professionals have been trained or mentored in **data management and analysis.**



The International Development Innovation Network at MIT has trained more than 1,000 people in **collaborative design** who have gone on to train nearly 7,000 more people.



Capacity-building supported by HESN Labs comes in many formats to meet participants' needs: through training **workshops**, many hundreds of students, faculty, and community members have received skills applicable to innovation and research.



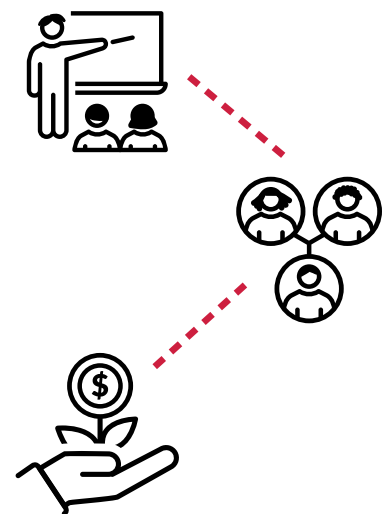
- For example, the Eastern Africa Resilience Innovation Lab at Makerere University in Uganda provides a workshop in human-centered design for students at Makerere and beyond, such as girls in a STEM camp in Uganda and students in medicine, technology, engineering, and business at the University of Rwanda. Participants get a hands-on introduction to design thinking principles such as need-finding, problem-framing, rapid prototyping, iteration, and storytelling around a proposed innovation geared to local needs. A biomedical engineering student at Makerere who completed the workshop, Julius Mugaga, went on to develop a prototype for his concept and won awards at two competitions. He later told organizers that the design thinking class was so useful, it should be a standard requirement for the biomedical engineering program. Since 2015, Julius has been awarded more than \$3,000 in additional prizes.

**Mentoring** has provided students and innovators with advice and assistance in technical areas, community outreach, or entrepreneurship.

- For example, the ResilientAfrica Network (RAN) matches participants with mentors; hosts “Innovation Garages” that provide direct access to experts; and helps participants apply for external funding. In RAN’s “Technovation Challenge,” women professionals provide online mentoring to teams of young women over three months in building mobile applications to solve community challenges.
- At Michigan State University, the Global Center for Food Systems Innovation (GCFSI) helps innovators secure funding and mentoring to support innovation-oriented research.

The Social Entrepreneurship Accelerator at Duke (SEAD) provides a three-year **peer-based engagement** to enterprises operating in East Africa and India that have experienced initial success in developing potentially transformative ways to address challenges in global health.

- Mentoring in-person and online helps the entrepreneurs increase the scale of their impact by understanding behavior change, forming partnerships in other sectors, managing their organizations’ growth, accessing funding, and assessing their performance.
- Those entrepreneurs later serve as mentors to entrepreneurs who are selected for the program in subsequent phases.
- Extending that learning, SEAD partner the Center for the Advancement of Social Entrepreneurship (CASE) developed “Smart Impact Capital,” an online training program for social entrepreneurs to help them prepare to raise investment capital more efficiently and effectively. Hundreds of entrepreneurs from over 20 countries have used the program since late 2015.



# PHOTOSYNQ

Worldwide | [gcfsi.isp.msu.edu](http://gcfsi.isp.msu.edu)

*PhotosynQ allows educators, researchers, farmers, and citizen scientists to collect plant and soil quality data from a low-cost, handheld device.*

**SUPPORTED BY**

Michigan State University's Global Center for Food Systems Innovation (GCFSI)

**CREATOR**

Prof. David Kramer



Photo: David Kramer



**PROBLEM ADDRESSED**

The rising global demand for food requires greater crop productivity. Increasing productivity requires the ability to measure how crops fare under actual conditions in the field. But the necessary equipment and expertise are out of reach for most farmers in developing countries.



**INNOVATIVE IDEA**

HESN-supported GCFSI developed a low-cost device called MultispeQ that farmers can use to measure environmental factors affecting the health of crops. The data is uploaded to a cloud-based platform called PhotosynQ through which researchers can interpret the data, predict outcomes, and help farmers select crops that will perform best in local conditions. The local data is added to a large database that researchers study to make high-level conclusions that can benefit many farmers.



**RESULTS**

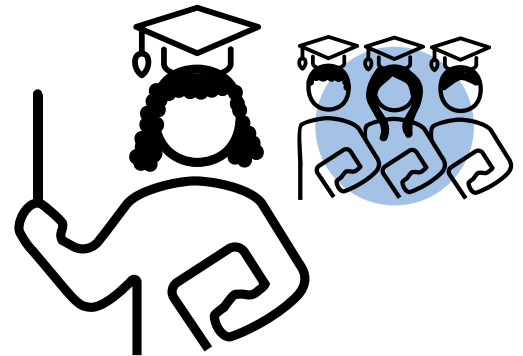
PhotosynQ users have collected more than 240,000 pieces of data from 670 projects, creating a large data set that researchers are using to better understand photosynthesis and plants' ability to resist drought and other climate shocks. Teams in multiple countries are adapting the device to increase resistance to pests and drought, measure aflatoxin in grain, and reduce energy costs in greenhouses.

**Peers train peers** in initiatives supported by HESN Labs:

- A conflict-mitigation initiative called "Sharing the Land," funded by the Center on Conflict and Development (ConDev) at Texas A&M University, is led by students at the Christian Bilingual University of Congo (UCBC). Recent graduates serve as teachers of current students, training them in digital data collection and introducing them to GPS and GIS technologies. The initiative is developing a series of trainings to strengthen the capacity of change agents to implement land tools that are pro-poor and gender-sensitive.
- Farmers teach fellow farmers about the benefits of farming without tilling the soil at the Center for No-Till Agriculture in Ghana supported by ConDev. Founded by farmer Kofi Boa, the Center develops and disseminates conservation agriculture techniques through training events and demonstration centers, where farmers can observe new techniques that they might not otherwise try on their own. Since 2013, the Center has trained more than 2300 people.
- Of the more than 800 people who have been trained at design summits organized by the International Development Innovation Network (IDIN), about two-thirds have gone on to teach design and co-creation in their own communities and universities through classes, programs, trainings, or makerspaces. To encourage that dissemination of the collaborative design approach, IDIN launched a program of grants to support such trainings. Past participants and their partners have held more than 200 such trainings for almost 7,000 trainees.

HESN Labs **build the capacity of faculty** at universities in developing countries.

- At Texas A&M, ConDev supports capacity-building at higher education institutions in countries including Afghanistan, the Democratic Republic of the Congo, Guatemala, and Uganda. For example, ConDev is helping faculty at three universities address the effects of natural resource extraction through teaching and research. Additionally, ConDev is advising on the development of curriculum in environmental conservation during oil drilling; administering grants to faculty to research transformative solutions to problems caused by conflict and mineral extraction industries; and helping faculty apply to Ph.D programs.
- To promote the sustainability of local innovation programming in the long term, IDIN provides capacity-building to universities, innovation centers, and other institutions in 14 countries. Through workshops, retreats, online discussions, and collaborative platforms, IDIN has built those partners' capacity to deliver curricula, develop business models, and conduct monitoring and evaluation. IDIN began gathering faculty members from universities around the world to be exposed to IDIN's pedagogy and to explore collaborations in design education.



*This web of capacity building initiatives facilitate new approaches to increase the chance of success for the projects in the short term as well as the chance of sustainability of impact after the projects have concluded.*

## INVENTION SPOTLIGHT

### CELLSCOPE

Congo, Vietnam, Cameroon | [dil.berkeley.edu](http://dil.berkeley.edu)

*Mobile digital microscopy as a platform for disease diagnosis that can be used by non-expert health workers in remote settings*

#### SUPPORTED BY

UC Berkeley Development Impact Lab

#### CREATOR

The Fletcher Lab at UC Berkeley

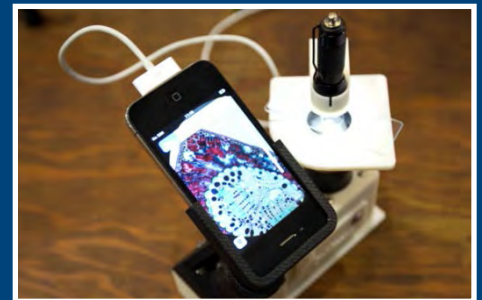


Photo: UC Berkeley



#### PROBLEM ADDRESSED

In developing countries where healthcare infrastructure is limited, there is an urgent need for greater access to reliable diagnostic testing, particularly for infectious diseases.



#### INNOVATIVE IDEA

Specialized equipment attached to the camera of a standard smart phone becomes a diagnostic-quality microscope known as CellScope.



#### RESULTS

In 2015, the device was used to screen and treat 17,000 people around Yaounde, Cameroon, where it successfully enabled treatment for onchocerciasis, a disease caused by parasitic worms. CellScope has already spawned two versions. CellScope Loa allows a smartphone to automatically detect and measure infection by parasitic worms, with results as accurate as conventional screening. CellScope TB, now in its second generation, ensures affordable digital microscopy for quality-assured tuberculosis diagnosis.

# The Development Labs

HESN is a consortium of organizations that have sourced nearly 500 innovations in 89 countries with more than 798 partners.\*

\*Partner lists for all HESN Labs are as of September 2017



## AidData Center for Development Policy

THE COLLEGE OF WILLIAM & MARY • DEVELOPMENT GATEWAY • BRIGHAM YOUNG UNIVERSITY  
• UNIVERSITY OF TEXAS AT AUSTIN • ESRI

### Partners

- Agency for Transformation
- Asian Institute of Technology and Management
- Center for Environmental and Agricultural Policy Research, Extension, and Development
- Centre for ICT Policy in Eastern and Southern Africa
- Centre for Remote Sensing and GIS (CERSGIS)
- Department of Social Welfare and Development, Government of the Philippines
- Development Partnership Management Unit within the Ministry of Finance, Government of Timor-Leste
- Development Research, and Training
- Economic Policy Research Centre Fiscal Accountability and Transparency- Africa
- Economic Policy Research Centre
- Freedom Forum
- Initiative Prospective Agricole et Rurale
- Institute for Social and Environmental Transition- Nepal
- Instituto Mora
- Kathmandu University
- Local Interventions Group
- London School of Economics
- Map the Philippines
- Open Knowledge Foundation-Nepal
- Save the Children
- Save the Children-Nepal
- Seeds of Life
- Transparency International-Nepal
- Transparency International-Uganda
- Uganda Debt Network
- UNICEF Uganda
- Universidad Nacional Autonoma de Honduras
- Women of Uganda Network



# Comprehensive Initiative on Technology Evaluation (CITE) at MIT

PHOTO: MARK BRENNAN

D-LAB • DEPARTMENT OF URBAN STUDIES AND PLANNING • SOCIOTECHNICAL SYSTEMS RESEARCH CENTER • CENTER FOR TRANSPORTATION AND LOGISTICS • PUBLIC SERVICE CENTER • SLOAN SCHOOL OF MANAGEMENT • DEPARTMENT OF MECHANICAL ENGINEERING

## Partners

Ahmedabad Municipal Corporation  
All India Disaster Mitigation Institute  
Alliance for a Green Revolution in Africa (AGRA)  
Centre for Environmental Planning and Technology  
University, Ahmedabad  
Committee on Sustainability Assessment  
Course Gateway  
Dalhousie University  
Development Alternatives Incorporated  
Dutch Government  
East Meets West  
Free Wheelchair Mission  
Global Knowledge Initiative (GKI)  
GrainPro  
Grand Challenges for Development  
Hanken School of Economics-Helsinki  
iHouse  
Indian Institute of Management-Ahmedabad  
Indian Institute of Technology-Gandhinagar  
International Rescue Committee  
International Society of Wheelchair Professionals  
Isla Urbana  
Kansas State University  
Kopernik  
Kwame Nkrumah University of Science and  
Technology  
Liter of Light  
London School of Economics  
Makerere University  
Malaria Consortium  
Mercy Corps  
MIT Educational Arcade  
North American Millers' Association  
Oxfam America  
Partners in Health  
Peace Corps  
Planet READ  
Powering Africa  
President's Malaria Initiative  
ProvisionGard  
Purdue University  
Puspadi  
Root Capital  
Scheller Teacher Education Program  
SenSen  
SESAME Street



PHOTO: MARK BRENNAN

# Comprehensive Initiative on Technology Evaluation (CITE) at MIT

D-LAB • DEPARTMENT OF URBAN STUDIES AND PLANNING • SOCIOTECHNICAL SYSTEMS RESEARCH CENTER • CENTER FOR TRANSPORTATION AND LOGISTICS • PUBLIC SERVICE CENTER • SLOAN SCHOOL OF MANAGEMENT • DEPARTMENT OF MECHANICAL ENGINEERING

## *Partners continued*

Self Employed Women's Association  
Singapore University of Technology and Design  
Solar Sister  
Stanford University  
SunEdison  
Sustainable Food Lab  
Technology Exchange Lab  
TERI University  
Texas A&M  
The Global Knowledge Initiative  
The Institute of Rural Economy of Mali  
The Universitas Gadjah Mada (UGM)  
Tufts Food Aid Quality Review  
Tufts University  
UN World Food Programme  
UNICEF  
United Cerebral Palsy Roda Untuk Kemanusiaan  
United Cerebral Palsy Wheels  
Universidad de Ingeniería y Tecnología  
University of Manchester  
University of Pittsburgh, Human Engineering Research Lab

U.S. Department of Agriculture  
U.S. Dry Pea and Lentil Council  
U.S. Wheat Associates  
Vikram Sarabhai Centre for Development Interaction (VIKSAT)  
William Davidson Institute at the University of Michigan  
World Food Programme  
World Vegetable Center  
World Vision



# Center on Conflict and Development (ConDev)

TEXAS A&M UNIVERSITY: COLLEGE OF AGRICULTURE AND LIFE SCIENCES, BUSH SCHOOL OF GOVERNMENT AND PUBLIC SERVICE, SCHOOL OF PUBLIC HEALTH, COLLEGE OF LIBERAL ARTS

• HOWARD G. BUFFETT FOUNDATION • CONFLICT AND DEVELOPMENT FOUNDATION

## Partners

Asian Vegetable Research and Development Center  
Asociacion de Desarrollo Integral Pueblos Hermanos, Guatemala  
Butembo-Beni Diocese of Caritas, DRC  
Catholic University of Graben, DRC  
Christian Bilingual University of Congo  
Ecoexist  
El Salvador Olympic Committee, El Salvador  
Food for the Poor  
Integrative Research Institute, DRC  
José Simeón Cañas Central American University, El Salvador  
Latin American Social Sciences Institute (FLACSO)  
North America Virunga Fund  
Semilla Nueva, Guatemala  
Shelter the Homeless International Projects, El Salvador  
Trimble Navigation  
University of San Carlos, Guatemala  
Virunga National Park, DRC  
VredesEilanden



PHOTO: ODHIAMBO FRANKLIN

# Development Impact Lab (DIL)

UNIVERSITY OF CALIFORNIA, BERKELEY: BLUM CENTER FOR DEVELOPING ECONOMIES, CENTER FOR EFFECTIVE GLOBAL ACTION, TECHNOLOGY AND INFRASTRUCTURE FOR EMERGING REGIONS GROUP • UNIVERSITY OF CALIFORNIA, SAN DIEGO'S POLICY DESIGN AND EVALUATION LAB • UNIVERSITY OF MICHIGAN • UNIVERSITY OF WASHINGTON • PORTLAND STATE UNIVERSITY • LAWRENCE BERKELEY NATIONAL LABORATORY'S INSTITUTE FOR GLOBALLY TRANSFORMATIVE TECHNOLOGY

## Partners

- AMREF
- Abdul Latif Jameel Poverty Action Lab (J-PAL)
- Agrinet
- Telecom Regulatory Authority of Afghanistan (ATRA)
- Aspiring Minds
- The Bill & Melinda Gates Foundation
- BRAC
- Centre for Good Governance
- DelAgua
- Delhi Tax Authority
- Democracy International
- Dhaphdapi High School
- École Polytechnique Fédérale de Lausanne
- Elsevier
- Endaga
- Engineering for Change
- Facebook/Internet.org
- GiveDirectly

- Global Broadband Initiative
- Global Change Programme at Jadavpur University
- Gram Power (India)
- IBM Research Africa
- IIT Bombay
- Indo-US Science & Tech Forum
- Innovations for Poverty Action
- Intuitive Surgical
- InVenture
- Jaipur DISCOM
- Jadavpur University
- Jobs Shikari
- Kenya Lighting and Power Company
- Knowledge Pele
- LIGTT Institute
- Livity
- LivPure
- Long Xuyen City People's Committee





# Development Impact Lab (DIL)

UNIVERSITY OF CALIFORNIA, BERKELEY: BLUM CENTER FOR DEVELOPING ECONOMIES, CENTER FOR EFFECTIVE GLOBAL ACTION, TECHNOLOGY AND INFRASTRUCTURE FOR EMERGING REGIONS GROUP • UNIVERSITY OF CALIFORNIA, SAN DIEGO'S POLICY DESIGN AND EVALUATION LAB • UNIVERSITY OF MICHIGAN • UNIVERSITY OF WASHINGTON • PORTLAND STATE UNIVERSITY • LAWRENCE BERKELEY NATIONAL LABORATORY'S INSTITUTE FOR GLOBALLY TRANSFORMATIVE TECHNOLOGY

## *Partners continued*

Luminous Water Technologies Ltd

Makerere University

Millenium Challenge Corporation

Minh Tran, Inc (Vietnam)

MiniSante Rwanda

Ministry of Drinking Water and Sanitation, India

Ministry of Health, Vietnam

Ministry of New and Renewable Energy, India

NSDC

National Environmental Engineering Research  
Institute (NEERI)

National Institutes of Health

National University, Philippines

Prækelt Foundation South Africa

Potential Energy

Ramky Engineers Pvt. Ltd.

Re-Materials

Roshan Telecommunications

Rural Electrification Authority (Kenya)

Society for the Advancement of Village Economy  
(SAVE)

Stop TB Partnership

UNHCR

University of the Philippines - Diliman

VES (Vietnam)



# Global Center for Food Systems Innovation (GCFSI)

## MICHIGAN STATE UNIVERSITY

Colleges of Agriculture and Natural Resources, Communication Arts and Sciences, Education, Engineering, Social Science; International Studies and Programs; Center for Regional Food Systems; Hub for Innovation in Learning and Technology

### Partners

AgriNet

Amelioration of Agricultural Risk

Arusha Technical College

Biosciences Eastern and Central Africa

Buginyanya Zonal Agriculture Research and  
Development Institute

Center for Regional Food Systems

Centro Internacional de Agricultural Tropical, Colombia

CRDF Global

The Earth Institute, Columbia University

Egerton University

Grameen Foundation

Green Heat (Kampala, Uganda)

Indian Agricultural Research Institute

Innovations for Poverty Action (IPA)

International Center for Tropical Agriculture, Vietnam

International Food Policy Research Institute (IFPRI)

International Livestock Research Institute

Kudu

Lilongwe University of Agriculture and Natural  
Resources (LUANAR)

Makerere University

Massachusetts Institute of Technology, D-Lab

Mediae

National Semi Arid Resources Research Institute

National Smallholder Farmers Association of Malawi

Osho Grain Millers Ltd.

Penn State University

Regional Universities Forum for Capacity Building  
in Agriculture (RUFORUM)

Sokoine University of Agriculture

South Eastern Kenya University

Tanzania Industrial Research and Development  
Organization

Texas A&M University

The Energy and Resources Institute (TERI), India

Tuskegee University

University of California, Berkeley/Development

Impact Lab/Blum Center for Developing

Economies/Big Ideas Competition

University of California, Davis

University of California, San Diego

University of Georgia

University of Nairobi

University of Wisconsin, Madison

Virginia Tech

Wageningen University and Research Center,  
the Netherlands

Western Michigan University



# International Development Innovation Network (IDIN)

MASSACHUSETTS INSTITUTE OF TECHNOLOGY D-LAB • OLIN COLLEGE OF ENGINEERING  
 • COLORADO STATE UNIVERSITY • UNIVERSITY OF CALIFORNIA DAVIS TWENDE • SOCIAL  
 INNOVATION CENTER • ECHO EAST AFRICA IMPACT CENTER • TET CENTRE (UGANDA)  
 • NATIONAL TECHNOLOGY BUSINESS CENTRE (ZAMBIA) • KWAME NKRUMAH  
 UNIVERSITY OF SCIENCE AND TECHNOLOGY (GHANA) • VILA NOVA ESPERANCA (BRAZIL)

## Partners

Arusha Technical College

Avani

B.S. Abdur Rahman University

BogoHack

Bogota Innovation Center

Botswana Innovation Hub

C-Innova

Caos Focado

Caritas Gulu Archdiocese

Center for Integrated Research and Community  
 Development, Uganda (CIRCODU)

Centre for Research in Energy and Energy  
 Conservation (CREEC)

Change Hub Kenya

Chulalongkorn University Center for Social  
 Development

Cirad - Agricultural Research for Development

Colegio Visconde de Porto Seguro

E Coopernova Cotia Recicla

Copperbelt University

DAGMA (Departamento Administrativo de  
 Gestión del Medio Ambiente)

DefkoAkNiep Lab

DSIL Global

ECHO East Africa Impact Center, Tanzania

Essmart

GIC Space

Global Alliance for Clean Cookstoves

Hive Innospace

Information Technology University, Pakistan

InLabs

Instituto Peabiru

Instituto Tecnológico de Aeronautica

Kafue Innovation Center

Kepler Tech Lab

Kulika

Kumasi Hive

Laika Academy

Link 4

Make-i-stan Innovation Center



PHOTO: KENDRA SHARP

# International Development Innovation Network (IDIN)

MASSACHUSETTS INSTITUTE OF TECHNOLOGY D-LAB • OLIN COLLEGE OF ENGINEERING  
• COLORADO STATE UNIVERSITY • UNIVERSITY OF CALIFORNIA DAVIS TWENDE • SOCIAL  
INNOVATION CENTER • ECHO EAST AFRICA IMPACT CENTER • TET CENTRE (UGANDA)  
• NATIONAL TECHNOLOGY BUSINESS CENTRE (ZAMBIA) • KWAME NKRUMAH  
UNIVERSITY OF SCIENCE AND TECHNOLOGY (GHANA) • VILA NOVA ESPERANCA (BRAZIL)

## *Partners continued*

MakeWeMake  
Misamis Oriental State College of Agriculture  
New Economy Venture Accelerator  
Nelson Mandela Institute of Science and Technology  
Peace Innovation Lab  
Population Services International  
PoupaCerto  
Project DEFY  
Prolinnova  
Raitong Organics Farm  
Restoration of Green Environment and Eradication  
Rise Legs  
Root Capital  
Rural Community Network  
Siemens Stiftung  
Singapore Polytechnic University, Singapore  
Sicket Innovation Lab  
Teso Women's Development Initiatives  
These Hands

Tufts University  
Ubuni Studios  
UNEP  
UNHCR  
UNICEF  
United States International University (USIU)  
Universidad Nacional de Bogotá  
Universidad del Valle  
University of Botswana  
Veracidade  
Victronix Workshop  
World Vision



# ResilientAfrica Network (RAN)

MAKERERE UNIVERSITY, UGANDA • TULANE UNIVERSITY'S DISASTER RESILIENCE LEADERSHIP ACADEMY • STANFORD UNIVERSITY • CENTER FOR STRATEGIC AND INTERNATIONAL STUDIES • GEORGE WASHINGTON UNIVERSITY

## Partners

Aga Khan Foundation  
Belgian Technical Corporation (UBC)  
Benadir University, Somalia  
Bridgespan  
Enterprise Uganda  
Gauteng Accelerator Programme (GAP)  
Global Knowledge Initiative  
Global Obesity Prevention Center at Johns Hopkins  
Gulu University, Uganda  
Humanitarian Leadership Academy (HLA)  
IGAD Climate Prediction and Application Centre (ICPAC)  
Intergovernmental Authority on Development (IGAD)  
Jimma University, Ethiopia  
Johnson and Johnson  
Lilongwe University of Agriculture and Natural Resources, Malawi  
Makerere University, Uganda  
Makerspace  
Muhimbili University of Health and Allied Sciences  
National Information Technology Authority (NITA-U)  
National University of Rwanda  
Netlabs

Rockefeller Foundation  
Technology Innovation Agency (TIA)  
The Innovation Hub  
Uganda Communications Commission (UCC)  
Uganda Development Bank (UDB)  
Uganda Investment Authority (UIA)  
UN Women  
United Nations Children's Fund (UNICEF)  
United Nations Development Programme (UNDP)  
United Nations High Commissioner for Refugees (UNHCR)  
University for Development Studies in Ghana  
University of Addis Ababa, Ethiopia  
University of Bamako, Mali  
University of Dakar, Senegal  
University of Education, Ghana  
University of Kinshasa, DRC  
University of Limpopo, South Africa  
University of Nairobi  
University of Pretoria in South Africa  
University of Winneba  
Vigrow Hub  
Zimbabwe Africa University



PHOTO: ISHAN THAKORE

# The Social Entrepreneurship Accelerator at Duke (SEAD)

DUKE UNIVERSITY: DUKE MEDICINE/INTERNATIONAL PARTNERSHIP FOR INNOVATIVE HEALTHCARE DELIVERY, FUQUA SCHOOL OF BUSINESS/CENTER FOR THE ADVANCEMENT FOR SOCIAL ENTREPRENEURSHIP, GLOBAL HEALTH INSTITUTE • INVESTORS' CIRCLE

## Partners

Afya Research Africa

Arogya Finance

Ayazh

Bodhi Health

BTL Consulting

Calvert Foundation

Carnegie Mellon Rwanda University

Changamka

ClickMedix

Duke Africa Initiative

Excelsior Group

Forus Health

Intellect Advisors

Jacaranda

LifeNet International

MicroClinic Technologies

Naya Jeevan

Noora Health

North Star Alliance

On Frontiers

Open Capital Advisors

Operation ASHA

Penda Health

Riders for Health

Safe Water and AIDS Project (SWAP)

salaUno

SevaMob

Sproxil

Strathmore University

SughaVazhvu

Swasth

ThinkPlace

Vaatsalya

Vera Solutions

We Care Solar

ZanaAfrica

# Complex Challenges Addressed by HESN Partners

The HESN Development Labs are working on the spectrum of development issues. Examples are listed below to illustrate the breadth of the Labs' scope and the interdisciplinary approaches taken by the Labs.

## HEALTH: Access

### IDIN at MIT

- IDIN supported Afya Poa, a partnership to provide health insurance coverage for more than 2,000 informal workers in Kenya through daily micropayments.
- Design summits have produced innovations to improve access in resource-poor communities such as a system to provide diagnosis in the home and deliver medication, and a medical box with organizational tools and supplies that reduce contamination rates.

### SEAD at Duke

- The NorthStar Alliance manages a network of Roadside Wellness Centers using converted shipping containers placed along Africa's transport corridors, helping provide services for more than one million underserved people in 13 countries as of 2016.
- Safe Water and AIDS Project increases access to healthcare in rural Kenya by maintaining a Community Health Promoter network (including more than 6,300 individual vendors) to provide health education and door-to-door sales of health and hygiene products. A two-year study of 60 villages showed a decrease in diarrhea rates from 10 percent to less than one percent.
- In India and Cambodia, Operation ASHA combats the spread of drug-resistant tuberculosis through an innovative SMS and biometric technology system to ensure TB treatment compliance. Default rates on TB treatment were reduced to 2.4 percent from an average rate of 11.75 percent in 2013.



## HEALTH: Water quality

### CITE at MIT

- Faculty, staff, and students evaluated affordable water filters and kits to test water quality in parts of India troubled by contaminants such as *E. coli*.

### RAN at Makerere University

- The Horn of Africa RILab team is developing a technique for rainwater harvesting and purification.

### DIL at UC Berkeley

- ElectroChemical Arsenic Remediation (ECAR) is a reliable, affordable, and community-based water treatment technology for arsenic removal. A community-scale water treatment reactor was piloted at a school in West Bengal, India with support from DIL and they have now built a 1400 sq.ft. plant producing 10,000 liters a day, providing water for 5,000 people per day.

## HEALTH: Diagnosis

### CITE at MIT

- CITE evaluated approaches to scale the use of kits for rapidly diagnosing malaria without lab equipment in Uganda.

### RAN at Makerere University

- RAN incubated Matibabu, a noninvasive malaria test app for smartphones.

### DIL at UC Berkeley

- CellScope is a mobile, easy-to-use device that turns a cell phone's camera into a diagnostic-quality microscope, enabling health workers to carry out lab-grade analysis remotely. The device has been developed for screening of parasitic, bacterial, and chronic diseases across a range of country contexts, including Cameroon, Nepal, Thailand, and Vietnam.
- DIL is supporting the design of a low-cost, portable diagnostic device in West Africa that can rapidly screen for sickle cell disease.

## HEALTH: Maternal and child health

### IDIN at MIT

- IDIN supported ayzh, Inc. in India, a \$2 Clean Birth Kit with all of the materials recommended by the World Health Organization for a clean, safe birth.
- An International Development Design Summit launched Just Milk, a social enterprise which designs a nipple shield that safely delivers drugs and nutrients to breastfeeding infants in low-resource settings to fight malnutrition, malaria, and HIV.
- Design summits have produced innovations to provide care in resource-poor communities such as a low-cost resuscitation device for newborns, decision-making tools for birth spacing, a growth and measuring system to combat malnutrition, and a multi-functional child safety harness.



## HEALTH: Infectious diseases

### **DIL at UC Berkeley**

- DIL supported designing rapid, point-of-care devices to screen for HIV in newborns in Kenya.

### **RAN at Makerere University**

- The Southern Africa RILab studies the root causes of adverse effects of HIV and AIDS in rural communities and developing innovations to reduce the impact of the disease.
- Makerere University students and faculty designed a better tent, called EpiTent, for field treatment of Ebola victims and other humanitarian uses.

### **SEAD at Duke**

- Innovation Challenge student competitions on pressing public health issues such as Ebola and the Zika virus.

## HEALTH: Chronic diseases

### **AidData at William & Mary**

- AidData worked with PEPFAR Nigeria and the Democratic Republic of the Congo to map program clinic locations to analyze whether PEPFAR is reaching populations in greatest need.
- AidData students developed a methodology to improve tracking of aid funds in response to the Ebola crisis in Liberia, which identified that 33 percent of total funds had been missed by other methods. AidData is adapting this method in partnership with the Global Development Lab Ebola Team to inform Ebola recovery efforts in Sierra Leone.

### **RAN at Makerere University**

- The Southern Africa RILab researches how chronic health conditions affect livelihoods. Given the physical labor necessary for livestock, one study recommended people with chronic illnesses should raise goats, which led to innovations in goat milk production.

## HEALTH: Nutrition

### **ConDev at Texas A&M**

- ConDev and partners are helping child nutrition efforts in the Democratic Republic of the Congo by evaluating the effectiveness of nutritional therapy treatments.

### **GCFSI at Michigan State University**

- A project in Tanzania is developing innovative food products from vitamin A-fortified, orange sweet potatoes to address the widespread vitamin deficiency and helping prevent blindness, while promoting enterprise development among women entrepreneurs.

## HEALTH: Disability

### **CITE at MIT**

- CITE is evaluating wheelchairs in Indonesia to understand needs in developing countries where users face rough terrain, distances, and low resources.

### **IDIN at MIT**

- A design summit in Botswana produced a wheelchair capable of traversing deep sand and withstanding stones and thorns.

## COPING WITH AND OVERCOMING POVERTY: Living conditions

### **IDIN at MIT**

- IDIN supports PoupaCerto, a social enterprise offering a mobile application to help low-income households track and accomplish financial goals in Brazil.
- The Lean Research movement promotes practices for conducting research in communities affected by poverty to maximize the positive impact on participants and end users.
- Design summits produced innovative cooking stoves that release less harmful smoke and use less fuel.

### **DIL at UC Berkeley**

- The Rural Electric Power Project is developing village-scale microgrids, smart meters, and financing mechanisms to bring electricity to low-income households in India and Kenya.
- The Affordable Recycled Modular Roofs project is developing affordable modular roofing tiles made from durable recycled materials for slum housing in India.

### **ConDev at Texas A&M**

- ConDev works to empower those most vulnerable, including migrant and refugee populations through initiatives in El Salvador, Student Media Grants in Nigeria and Kenya, and capstone courses with the Bush School of Government and Public Service.

### **AidData at William & Mary**

- AidData Research Consortium Members at Stanford University developed a methodology to better measure sub-national poverty rates using satellite imagery and machine learning. Scientific American named this one of “10 World Changing Ideas” for 2016.

## COPING WITH AND OVERCOMING POVERTY: Youth Development

### **ConDev at Texas A&M**

- ConDev and partners are helping youth employment programs by evaluating the effectiveness of vocational training for former child soldiers and homeless youth in the Democratic Republic of the Congo.
- ConDev provides funding for AgriCorps, which trains rural youth in developing countries about agricultural technology and critical-thinking skills.

## INFORMATION AND COMMUNICATION TECHNOLOGY: Mobile telephones

### DIL at UC Berkeley

- The Community Cellular Network is a low-cost, low-power cellular network that is designed for, owned, and operated by rural local communities. Via a new social enterprise, Endaga, the project has launched operations in Indonesia, Mexico, Pakistan, and the Philippines.
- DIL supported M-Pasandaaz in Afghanistan, which allows people to manage savings via mobile phones.
- DIL supported a smartphone application enabling citizens to monitor elections in real-time and share vote totals and photos in South Africa, reaching hundreds of thousands of people.
- The crowdsourcing, text-message platform NextDrop alerts consumers in India who experience erratic water service when water is available.
- With University of Michigan, DIL is developing GridWatch, a system that uses mobile phones to detect power outages and other conditions in the electrical grid, providing a new independent source of information for regulators, customers, and researchers.
- DIL is supporting a novel SMS energy alert system (Cool Joule) that allows Nicaraguan energy consumers to set and monitor monthly household energy limits (cost and amount).

### GCFSI at Michigan State University

- GCFSI grant supported the use of text messages and social networks to help women entrepreneurs in Tanzania produce sweet potatoes.

### RAN at Makerere University

- The Eastern Africa RILab incubated a community radio powered by a mobile phone, called RootIO.

### ConDev at Texas A&M

- Farmers and extension agents were given smartphones to share images of production challenges, recognize shared problems, and build social cohesion through text messages.

## INFORMATION AND COMMUNICATION TECHNOLOGY: Distance learning

### GCFSI at Michigan State University

- In Malawi, an innovation hub operated by GCFSI and the Lilongwe University of Agriculture and Natural Resources, is assessing if videos of farmers performing advanced management practices would be a successful way to provide extension training to smallholder farmers.



A group of girls from Orkolili Secondary taught a local women's group to make charcoal stoves during community visits and collaboration in Orkolili, Tanzania.

## DEMOCRACY AND GOVERNANCE: Strengthening institutions

### ConDev at Texas A&M

- Support from the Howard G. Buffett Foundation enabled creation of the Congo Peace Center to promote regional stability linked to locally driven development in the Democratic Republic of the Congo.

### AidData at William & Mary

- AidData works with governments to create an open data infrastructure enabling officials to make more informed aid allocation and targeting decisions.
- AidData evaluations are helping USAID improve its projects aimed at increasing municipal government legitimacy in Colombia and government responsiveness in Niger.
- Research projects are examining the effect of transparency on “leakage” of development resources in Indonesia and upon infrastructure projects in Ghana with USAID, as well as how politics influences development aid distribution in Malawi.
- Initiated research in the Philippines, Nepal, Timor-Leste, and Honduras to evaluate the impact of data use on development decisions.
- Fielded survey of 55,000 policymakers to assess what data they prefer to use.

## DEMOCRACY AND GOVERNANCE: Citizen engagement

### ConDev at Texas A&M

- Students traveled to study how voters are affected by information delivery in Benin and influential local figures in Senegal.

### AidData at William & Mary

- AidData supported research which demonstrated that informing intended beneficiaries of a rice subsidy program in 572 Indonesian villages of their rights reduced the “leakage” of program funds through corruption by 26 percent.
- AidData supported an evaluation of the effectiveness of enlisting citizens to monitor sanitation services in Uganda.

### DIL at UC Berkeley

- The Collective Assessment and Feedback Engine (CAFÉ) is an online platform that gives community members immediate visual feedback about their positions on key issues relative to other community members. DIL is piloting CAFÉ in Mexico to help citizens advise their government on policy issues and in Uganda to help researchers assess public perceptions of rural maternal healthcare services.

## NATURAL RESOURCE MANAGEMENT: For building peace

### ConDev at Texas A&M

- In the Democratic Republic of the Congo, student researchers are using GIS and GPS technologies coupled with community organizing principles to mobilize community stakeholders to address land conflict, improve urban planning, and develop a more transparent and effective land management system.

Workshop going on before IDDS Skill builder activities. IDDS Educación - Bogotá, Colombia.



## NATURAL RESOURCE MANAGEMENT: Conservation

### **AidData at William & Mary**

- AidData Research Consortium members performed geospatial impact evaluation with USAID/Ecuador to measure the conservation impacts of a land tenure program.
- AidData worked with USAID/Peru to map donors' investments in biodiversity in the Amazon Basin.

## NATURAL RESOURCE MANAGEMENT: Pollution

### **DIL at UC Berkeley**

- The Low-Cost Air Pollution Monitoring project aims to deploy air-quality sensing devices on motorcycle taxis in Uganda to produce a detailed and near real-time map of air pollution.

## NATURAL RESOURCE MANAGEMENT: Waste management

### **IDIN at MIT**

- Design summits have produced waste-management innovations for low-income communities such as a ramp to transport and compress bottles, a communications strategy for plastic bottle processing, a brick made of recycled waste, a grinder to quickly compost waste, and a kitchen counter with a built-in separator for organic waste.

## FOOD SECURITY: Innovations for problems in global food systems

### **GCFSI at Michigan State University**

- GCFSI supports innovations and analytical tools to help the food system keep up with population growth, climate change, urbanization, and workforce development.

## FOOD SECURITY: Build on local coping strategies

### **ConDev at Texas A&M**

- ConDev enables local farmers to leverage ICTs for increased social cohesion, market information sharing, and peace.
- In Guatemala, ConDev and others are introducing high-protein maize to alleviate malnutrition and related domestic violence.

## FOOD SECURITY: Sustainability

### **IDIN at MIT**

- IDIN awarded a microgrant to Avomeru, a social enterprise enabling avocado farmers to produce high-quality avocado oil out of excess crops in Tanzania.

### **ConDev at Texas A&M**

- The Center for No-Till Agriculture in Ghana generates the capacity and incentive for local farmers to adopt more sustainable farming practices in lieu of slash-and-burn methods.

## FOOD SECURITY: Testing innovations to improve agricultural yield and storage

### **GCSFI at Michigan State University**

- GCSFI's Malawi innovation hub is projecting how changes in management practices and crops could improve productivity and resilience to climate change.
- GCSFI grant supported in Kenya called "e-warehousing" helps small farmers store their crops to wait for a better price and get financing for living costs while waiting.
- Grant-supported project aims to improve food storage and processing capabilities of smallholder farmers and their villages by constructing and testing two types of low carbon-footprint cool storage structures.

### **CITE at MIT**

- CITE evaluated methods to scale storage technology for smallholder farmers in Uganda to reduce spoilage of food while in post-harvest storage.

### **IDIN at MIT**

- IDIN supports Zasaka, an agricultural venture that improves yields, eliminates post-harvest loss, and empowers farmers to eliminate seasonal hunger, which has now reached over 2,600 farmers in Zambia.
- Design summits have produced innovative tools to assist farmers including a bicycle-powered coffee bean sheller, an avocado oil press, a human-powered manure spreader, a small-scale hay baler a fodder chopper, precision planter, stirrup hoe, and weed roller.

### **RAN at Makerere University**

- The Rapid Agricultural Produce Indirect Dryer (RAPID) concentrates solar energy to increase the efficiency of drying crops post-harvest at low cost, reducing losses and contamination.
- RAN's Eastern Africa RILab is testing mass-breeding of earthworms for chicken feed, and natural pest and weed control through inter-cropping to increase agricultural yield.
- RAN's Southern Africa RILab lab funds projects on food security and improved income generation through pitching events and other means.
- RAN's West Africa RILab focuses on strengthening the resilience of communities responding to rapid urbanization, food insecurity, and population growth in Ghana, Senegal, and Mali.

## FOOD SECURITY: Crop diversification

### RAN at Makerere University

- RAN projects such as “Mushrooming Livelihoods” are introducing new crops.

### GCFSI at Michigan State University

- A Student Innovation grant is testing new fish food in Kenya to increase yield of a vital protein source.

### IDIN at MIT

- A summit in Brazil's Amazon region designed a low-cost habitat where locals can raise shrimp, and created machines to ease peeling and scraping cassava root.

## GENDER: Fully integrate gender in all research and solutions

### ConDev at Texas A&M

- ConDev is committed to incorporating gender-sensitive research into all of its programs and research initiatives, with a particular focus on creating opportunities for women through agricultural education.

“Pattis,” or grandmothers in Sittilingi Valley outside of Chennai, India, spent the afternoon sharing their collective community health knowledge with participants building technologies as a part of IDDS Aarogyam, a design summit organized by IDIN.





## GENDER: Women's empowerment

### **GCFSI at Michigan State University**

- GCFSI grant in Tanzania supported the use of text messages and social networks to help women entrepreneurs produce sweet potatoes.
- GCFSI conducts gender analysis to ensure that designed innovations are responsive to the needs of all actors in the food system.

### **SEAD at Duke**

- A “Women in Entrepreneurship” event in East Africa gathered 14 women entrepreneurs in the health-care sector to discuss challenges including getting traction for women-centric innovative solutions and accessing capital.

## RESILIENCE: The capacity to mitigate, adapt to, recover, and learn from shocks and stresses

### **RAN at Makerere University**

- The Eastern Africa RILab at Makerere University examines communities' resilience in response to climate change and chronic conflict in Uganda, Rwanda, and the Democratic Republic of the Congo (DRC).
- The Horn of Africa RILab at Jimma University in Ethiopia concentrates on strengthening resilience to the effects of recurrent drought and chronic displacement.
- The Southern Africa RILab at the University of Pretoria in South Africa concentrates on the impact of chronic diseases, particularly HIV/AIDS, as well as issues of access to livelihood assets, and understanding local adaptive strategies in South Africa, Zimbabwe, and Malawi.
- The West Africa RILab at the University for Development Studies in Ghana focuses on strengthening the resilience of communities responding to rapid urbanization, food insecurity, and population growth in Ghana, Senegal, and Mali.

## RENEWABLE ENERGY: Biogas

### **GCFSI at Michigan State University**

- Faculty and local entrepreneurs are improving efficiency by converting waste into biogas for cooking and agricultural manure in Uganda.
- A grant to Ugandan students supports household biogas generators that use manure for lighting and cooking, conserving trees.



PHOTO: KENDRA SHARR, IDIN

Aspen Flynn, skills builder instructor and IDDS organizer, looks on as Thilagarajan P. tests out his very own charcoal press which he made using basic wood and metalworking skills in Chennai, India.

## RENEWABLE ENERGY: Solar

### **CITE at MIT**

Faculty, staff, and students are testing solutions including:

- Solar-powered lanterns in Uganda to replace expensive and dangerous fuels. CITE's methodology for testing solar lanterns in Uganda was used by MIT students in Morocco in 2014 to gauge demand for solar lights among rural residents and street vendors, and by MIT D-Lab's off-grid energy group to produce a solar lighting database.

### **RAN at Makerere University**

- The Eastern Africa RILab is incubating a low-cost, solar-powered, irrigation pump.
- The Southern Africa RILab awarded a grant to a student's concept for an affordable, locally-sourced solar still that purifies water with sunlight aimed at informal settlements without utility service.

### **DIL at UC Berkeley**

- DIL supported the Solar Suitcase by We Care Solar, a portable unit that provides electricity for off-grid medical clinics, thus reducing maternal and infant mortality in Africa, Haiti, and other regions.
- DIL supports the CAL-RAE solar microgrid project designed to supply renewable, efficient, and reliable solar energy in Uganda.

While the first phase of the Higher Education Solutions Network projects is winding down, we're excited to continue our partnership with universities now and into the future. USAID highly values our relationships with universities both in the U.S. and throughout the world and we are pleased to introduce new opportunities to join our network.

For the latest information, go to: <https://www.usaid.gov/hesn> ■

Two Tanzanian farmers utilize an irrigation system within a rice field, netting catfish for an additional income source.



PHOTO: KIRK MASON, GCFSI



**USAID**  
FROM THE AMERICAN PEOPLE