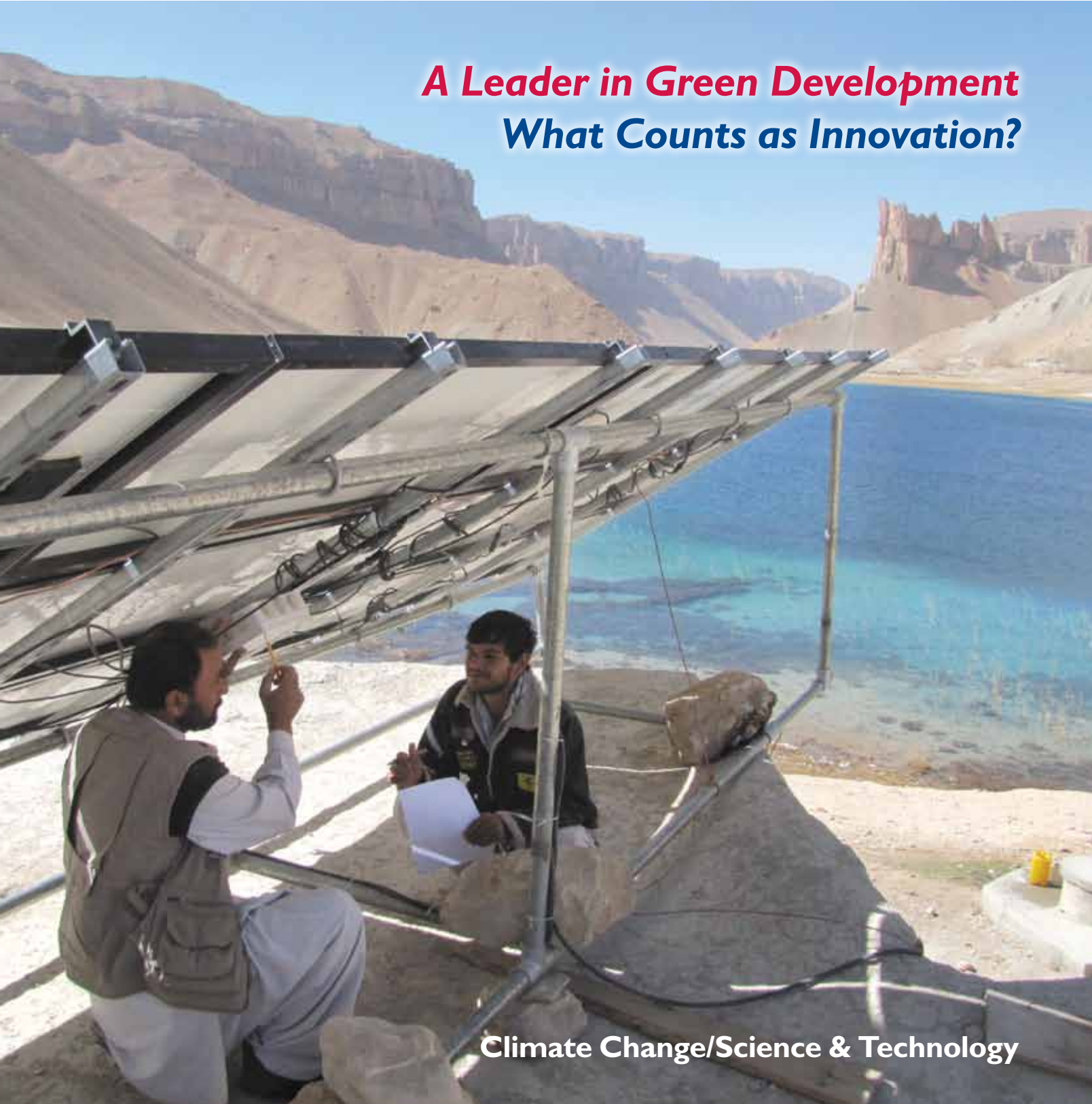


# FRONTLINES

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JUNE/JULY 2011

*A Leader in Green Development*  
*What Counts as Innovation?*



Climate Change/Science & Technology



# INSIGHTS

From Administrator Dr. Rajiv Shah

**A** FEW YEARS ago, I traveled to northern India to visit with a rural farming community, where about 30 percent of the children were chronically malnourished, and, therefore, stunted. The farmers faced increasingly difficult conditions as hotter, drier growing conditions had come to mean less food, lower incomes, and more poverty across the region. The children did not go to school, and their parents struggled every night to put food on the table.

At one point, struck by the visible poverty around me, I asked a group of farmers whether they had cell phones. I could tell immediately that they were deeply offended.

“Even the goat herders have cell phones,” they said. “And we’re farmers.”

The wide reach of cell phones has given us one of the most powerful development platforms ever. In northern India, farmers can now get real-time market price information and agricultural advice, and in Haiti, entrepreneurs can access safe and reliable mobile banking services.

Twenty years ago, no one could have predicted that cell phones would become the next transformative development innovation. No one could

have told you that the fastest growing market for cell phones in 2011 would be sub-Saharan Africa. No one could have guessed that more people in Africa than in America would have cell phones.

What actually happened across the past two decades to make this a reality? The spread of cell phones demonstrated an effective development path that is often followed by breakthroughs in science and technology.

Along with cell phone technology becoming cheaper, we also saw improved governance, private-sector reforms, and economic growth in Africa. In fact, African incomes grew at a faster rate than many developed world economies. Telecom companies built cell phone towers instead of fixed lines, and rapidly connected a continent where only one-third of the population had access to electricity.

The curve of cell phone distribution did not progress in a linear fashion. It bent upwards, dramatically. We must approach development with a similar mindset. Rather than achieve incremental gains by following the status quo, we have to bend the curve of progress in order to deliver cost-efficient, meaningful results.

This is why we are seeking new ways to reward innovation and harness the transformative power for science and

technology. This embrace of innovation forms the foundation of a new series of Grand Challenge partnerships that we introduced earlier this year. Our first Grand Challenge—called Saving Lives at Birth—called on a range of partners to develop new, groundbreaking solutions to prevent maternal and child deaths in regions where mothers will likely never see a hospital.

Over 600 innovators have answered this first call. Nearly half of the proposals came from outside the United States, and more than a quarter were received from developing countries. Each one has the potential to be the next breakthrough in maternal and infant health.

Today, several global trends have aligned, giving us an unprecedented opportunity to bend the curve of development progress. Combined with growing private sector engagement and the spread of democracy, rapid technological change has spurred new opportunities to accelerate growth, strengthen governance, and attend to human needs. Now, it is up to us to seize these opportunities and transform them into real results for developing countries. ■

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*“I realize that there are among us those who are weary of sustaining this continual effort to help other nations. But I would ask them to look at a map and recognize that many of those whom we help live on the ‘front lines’ of the long twilight struggle for freedom—that others are new nations posed between order and chaos—and the rest are older nations now undergoing a turbulent transition of new expectations. Our efforts to help them help themselves, to demonstrate and to strengthen the vitality of free institutions, are small in cost compared to our military outlays for the defense of freedom.”*

—John F. Kennedy, Special Message to the Congress on Foreign Aid, March 13, 1962

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**Cover:** Afghan technicians finish installation and testing of a solar array to provide power to the Shaheed Mahmoodi High School in Band-e Amir National Park in Bamiyan province.

Photo by Robert Foster, Winrock International



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MESSAGE FROM THE  
Global Climate Change Coordinator

# A LEADER IN GREEN DEVELOPMENT

By KIT BATTEN

IT IS MY PLEASURE to have joined USAID earlier this year, and to have this opportunity to reach out to the broader development community about USAID's leadership on climate change. As many of you know, climate change is one of the greatest economic, social, and environmental challenges of our time. USAID is working to help countries accelerate their transition to climate-resilient, low-emissions development, helping advance the global green economy.

We work with partner countries to invest in sustainable economic growth that is not only resilient to climate change but also reduces contributions to greenhouse gas (GHG) emissions.

Historically, developed countries have emitted most of the gases that are warming the planet, but this is changing. China recently passed the United States as the top overall GHG emitter, and the International Energy Agency estimates that more than 90 percent of carbon dioxide emissions growth from now until 2030 will come from the developing world.

Because their economies tend to rely on activities that are vulnerable to climate shocks, such as agriculture and tourism,



Kit Batten was appointed USAID's global climate change coordinator in January 2011. She coordinates climate change activities across all bureaus in the Agency.

the countries where USAID works are going to be particularly affected.

Investments in clean energy, sustainable forestry, and adaptation to climate change are also investments in sustainable economic growth. Economic development is not an additional or peripheral activity, but rather ingrained throughout our global climate change programs. As a result, USAID's substantial environment programming advances economic growth while ensuring reduction in greenhouse gas emissions, smart investments in adaptation, disaster preparedness and response,

the preservation of ecosystem services, and more.

USAID is considering how our activities affect greenhouse gas emissions and the impacts that a changing climate is already having (and will continue to have) on our globe and on USAID's work in order to make decisions about all of our development planning, programming, and activities.

For example, more variable rainfall, stronger storms, and increasing temperatures have the potential to reduce agricultural productivity; warming ocean temperatures and ocean acidification are already negatively impacting fisheries. These impacts are poised to undermine the livelihoods of millions in developing countries,

especially the poorest. Similarly, warmer temperatures, increased incidence of flooding and drought, saltwater intrusion into drinking-water supplies, climate-related impacts on food security, and the migration of disease vectors into new areas (such as mosquitoes carrying malaria) will affect public health by undermining access to clean water and sanitation, reducing nutrition, and changing disease distribution patterns and prevalence.

Implementing practical adaptation responses to these threats is an important

element of risk mitigation, both to ensure the livelihoods and health of USAID's beneficiaries and to ensure the sustainability of past, current, and future USAID development investments. Likewise, USAID's investments in reducing greenhouse gas emissions through investments in clean energy, energy efficiency, and sustainable forestry work to reduce current and future greenhouse gas emissions which have global implications.

This may seem a daunting challenge, but USAID is already leading the way in incorporating climate change across our development portfolio. And, I am pleased

to say USAID's new Climate Change and Development Strategy (see article, page 8) provides guidance and a roadmap for USAID's climate change work, including integration of climate considerations into everything that we do.

**USAID ALSO RECOGNIZES** that public financing cannot meet this challenge alone. Recent economic crises have clearly shown once again that our world is increasingly interdependent. Foreign aid, as traditionally conceived, is just one part of a dense web of economic relations between the developed and developing world. As a development agency,

USAID has a great deal in common with the private sector, and we have invested in more than 1,000 successful public-private partnerships as a result.

In fact, many of the challenges that businesses face overseas are really symptoms of the development challenges that we are working to address. For example, a company may be concerned with issues such as supply-chain stability or lack of qualified workers, while USAID seeks to improve opportunities for smallholder farmers or young people entering the workforce.

Under Administrator Rajiv Shah's leadership, USAID now has an opportunity to take our investments to a new level of success—investing in public-private partnerships at a larger scale and in a way that demonstrates our capability to leverage significant additional resources to further development goals. Examples of the types of investments USAID is pursuing include partnerships with renewable-electricity, clean-fuels, energy-efficiency, sustainable-forestry, and sustainable-supply-chain businesses to invest in clean economic growth as well as partnerships with water utilities, insurance or re-insurance companies, tourism industry, agricultural producers, and others to prepare for and respond to our changing climate.

I am proud that a portion of this issue of *FrontLines* focuses on climate change. The following pages outline examples of USAID's leadership on the Obama Administration's Global Climate Change Initiative and the integration of this work across our development portfolio. This is an exciting time to be working at USAID. ■



Photo by Ali Issah, Coastal Resources Center

Severe marine algae and seaweed have been inundating the areas near the western border of Ghana for over a decade, restricting the livelihoods of fishermen. Since 2009, USAID's Hen Mpoano Initiative has been working to discover the root causes, identify mitigation measures, and set the stage for alternative livelihoods in the affected areas.



Photo by Jewel Samad, AFP

# Leading the Charge for Low-Emission Sustainable Development

*Flagship climate program helps countries map unique pathways to economic gain in a way that reduces greenhouse gas emissions*

*By Ashley Allen and Ashley King*

**I**T'S DIFFICULT to imagine a country with greater energy needs and more acute climate vulnerability than Bangladesh. More than half of Bangladesh's 158 million people have no access to electricity, and the vast majority of those with access

do not have a reliable or affordable supply. What's more, unmet electricity demand is growing at a rate of 10 percent per year. The shortage of reliable power limits the country's economic growth and contributes to high poverty rates. At the same time, climate change puts the lives of millions of Bangladeshis at risk and threatens to

stall or reverse development gains over the last several decades.

On average, each flood in Bangladesh causes 148 deaths, affects 3.3 million people, and causes \$186 million in damage. A single devastating flood in 2004 affected more than 36 million people and cost the country \$2.2 billion. Because of its network of

A mother carries her child in one hand and a packet of collected food in the other down a flooded road on the outskirts of Dhaka, Bangladesh, in August 2002. Floods and other weather events are expected to become more frequent and severe in the face of climate change.



wetlands, rivers, and low-lying forests, Bangladesh is particularly prone to floods and storms—weather events that are expected to become more frequent and severe in the face of climate change.

For Bangladesh, and other developing countries, achieving long-term sustainable economic growth in the face of climate change and other threats is of primary concern. To help respond to this concern, in late 2010 the U.S. Government launched a program to help countries develop in a way that ultimately reduces greenhouse gas emissions growth and improves resilience to the effects of climate change.

“Much more than just a climate change or energy program, the Enhancing Capacity for Low Emission Development Strategies [EC-LEDS] program takes an economy-wide approach,” says Kit Batten, USAID global climate change coordinator. “It’s really about sustainable economic growth.”

Gone are the days when climate change strategies and programs were confined to the science and environmental communities. With new international political will and support for green growth and sustainable development, climate change is now being integrated into longer-term economic development plans that target new opportunities for green investments and tap into new sources of climate finance.

Though the path to low-emissions development may follow a different route in each country, at its core EC-LEDS helps draw the blueprint for each country’s green-growth strategy, partnering with key stakeholders to

ensure that the final product meets the country’s needs.

“Renewable energy development, energy sector reform—such as removing inefficient tariffs and subsidies—and national-level land and forest management are just some of the areas that the program might help developing countries map out in their own strategies,” says Bill Breed, USAID global climate change team leader.

Led by USAID and the State Department, the program also brings to bear the expertise of the U.S. Departments of Energy, Treasury, and Agriculture; the Environmental Protection



A USAID-supported carbon sequestration project in Quintana Roo, Mexico, helps protect the unique system of cenotes (a kind of sinkhole) and lagoons that spread across the Yucatan peninsula.

Agency; the U.S. Forest Service; and other agencies, making it a true whole-of-government response to global climate change. It is a key component of the U.S. contribution to the pledge made by developed countries at the 2009 U.N. climate change negotiations

to provide fast-start climate financing to developing countries by 2012.

Bangladesh was among the first U.S. partners in the program. After initial meetings between U.S. experts and the Bangladeshi Government, civil society, and other international donors to assess climate change and development strategies, government representatives are working to jointly map out an assistance plan. The plan identifies ways that the U.S. Government can partner with Bangladesh to help the country achieve a low-emissions pathway, for example, by helping it to update or improve national greenhouse gas inventories, conduct feasibility studies for renewable energy sources, or by sharing best practices in wild fisheries management to conserve wetlands.

On the other side of the world, Mexico, another partner, has emerged as a developing country leader in the effort to promote green economic growth.

In 2007, Mexico established the Special Program on Climate Change, or PECC, which outlines more than 100 mitigation and adaptation objectives to be achieved through almost 300 actions carried out by multiple federal agencies. Some of these actions include: using the biogas generated by landfills, agricultural residues, and other sources for energy; switching out old appliances for energy-efficient models; converting to compact fluorescent light bulbs; and promoting alternative sources of income for forest dwellers.

The effort comes at a pertinent time for Mexico, with a growing economy

*continued on p. 19*

# Financing Asia's New Clean Energy Markets

By Peter du Pont and Orestes Anastasia

KALIBO, Philippines

**R**ONALDO ZEQUE'S mill, outside this provincial capital, processes 300 sacks of rice each day. Afterwards, there are truckloads of husks to be discarded.

"We burn all our rice husks," says Zeque. "We don't have a choice. But we worry about the health hazards."

As well he should. The constant burning behind his mill creates a dangerous haze for his workers and pollutes the surrounding area. This hazard should soon disappear, however.

Zeque has signed a contract with Asea One Power Corp. to sell his rice husks to a power plant that will provide carbon-free electricity while supplying more than one-quarter of the electricity needs of Aklan province, where Kalibo is located. And what helps his community also helps him: Zeque will have two sources of income—from the sale of the rice husks, based on a pre-arranged unit price, and from a profit-sharing arrangement with Asea One. In fact, local farmers and millers who supply Asea One will receive 10 percent of the after-tax profits from the power plant developer.

Asea One is one of 21 companies in Asia that have launched new clean energy

projects as a result of a USAID-supported initiative called the Private Financing Advisory Network (PFAN). Until PFAN, dozens of small- and medium-sized clean energy businesses (involving \$1 million to \$50 million investments) like Asea



Farmers use a paddy thresher to separate rice straw from rice grains in a field in Aklan province.

One—which should be the most dynamic sector of the clean energy market—struggled to find financing, which is much more easily available for conventional, larger types of energy-sector investments. PFAN bridges that gap.

Launched in 2006 by the United States and 10 other donors, this global partnership initially focused on Africa and Latin America. In April 2009, the USAID Regional Development Mission for Asia (RDMA) brought PFAN to Asia. Since then, PFAN-Asia has also included funding from USAID/Indonesia and the U.S. Department of State.

**ASIA'S DRAMATIC** economic expansion over the past few decades has led to unprecedented reductions in poverty. But it has also led to serious strains on the region's environmental and health conditions. It is estimated that emissions of greenhouse gases in developing Asia from all energy sources will increase by about 55 percent by 2030. In the meantime, Asia's increasing reliance on energy imports has already led to increasing budget deficits and deep concerns about energy security.

In short, Asia needs clean energy—as quickly and efficiently as possible.

"Asia has the highest rate of growth in energy demand in the world and demand is expected to more than double by 2035," said Winston Bowman, regional environment director, RDMA.

"Without new market and policy incentives for clean energy, Asia's continued reliance on fossil fuels will create enormous pressures on the environment, globally and locally."

But significant challenges remain before Asia can look to its low-carbon future. One of the most important is the inability of small and medium enterprises, which should be powerful

Photo by Nick Keyes





Photo by Dairy Darilag

Former Philippines President Gloria Macapagal Arroyo attended the groundbreaking ceremony for the Asea One biomass power plant in Aklan province in December 2009.

drivers of the region's transformation, to find adequate financing for new clean energy projects.

That is where USAID and PFAN come in.

The problem is straightforward: clean energy developers and entrepreneurs are looking for project financing at the same time that financial institutions and private investors are looking for investment opportunities in the fast-growing clean energy market. But developers often lack the business skills to effectively pitch their projects to financial institutions. And financial institutions often lack the knowledge—and hence the confidence—to

invest in renewable energy and energy efficiency.

Enter PFAN. Its network of consultants, business coaches, and mentors act as honest brokers for project developers and investors alike, bringing the essential knowledge and skills together to structure deals that work.

"PFAN has been able to find an effective niche and have a transformative impact in the clean energy marketplace in Asia," says Michael Yates, mission director for USAID/RDMA. "The network's specialists work with project developers and help refine their business plans so they are ready for investors. They also work the other side, and help develop in-

vestors' technical and market knowledge about renewable energy and energy-efficiency financing."

PFAN selects the most promising projects from local entrepreneurs for mentoring, technology development, and feasibility before presenting them to investors at signature events.

Besides demonstrating greenhouse gas reductions, projects are chosen on the basis of six criteria—potential for profitability, competent management, innovation or uniqueness, scalability, social responsibility, and demonstrated environmental benefits.

PFAN projects vary considerably, including biogas, biomass, mini and micro hydropower, energy efficiency, solar photovoltaic, and electric vehicles. In a number of cases, the work takes place in areas that are historically underserved.

Back in Aklan, at Ronaldo Zeque's mill, the PFAN model has succeeded in making an entrepreneur out of a potential polluter. The power plant will help Zeque not only deal with agricultural waste, but also make him a partner in the new electricity venture. The new 12-megawatt plant will run entirely on agricultural waste—rice straw and rice husks—that farmers would otherwise throw away or burn.

By using local biomass materials for the power plant instead of importing power generated by coal or diesel plants in neighboring provinces, the plant will avoid 40,000 metric tons of carbon dioxide (CO<sub>2</sub>) each year, equivalent to planting more than a million trees. Generating electricity from biomass is carbon neutral because the CO<sub>2</sub> that is emitted when the rice husks are converted into electricity is recaptured in rice crops during the following growing season.

*continued on p. 13*

# Crafting a Strategy for a Changing Climate

By Julie L. Kunen

**C**LIMATE change is one of the greatest challenges of our generation. The poor in developing countries will likely be the first and hardest hit by climate change impacts because they are heavily dependent on climate-sensitive economic activities such as agriculture, fisheries, forestry, and tourism, and lack capacity to cope with economic and environmental shocks.

With more than a billion people at risk of increased water stress, and hundreds of millions at risk of sea-level rise, USAID, as part of the president's Global Climate Change Initiative, has crafted a comprehensive response—to alleviate unnecessary suffering, to seize opportunities provided by “green” growth, and to promote greater environmental stability on the planet.

Essentially, the Agency's first comprehensive strategy for climate change and development is a way to integrate climate change into the Agency's work in the regions and sectors most likely to be impacted.

Through the strategy, the U.S. Government is expanding opportunities to support clean and climate-resilient economic growth through innovation and investments with long-lasting environmental and development co-benefits. It is supporting countries as they build resilience to the impacts of climate change and move towards a less fossil fuel-dependent economy.

At its core, the strategy is built on the premise that sound development is central to meeting the climate change challenge and will lead to more stable and prosperous futures for our partners.

Climate change is not felt uniformly. Rather, current research finds that its impacts will vary by region. Melting glaciers are leading to rising sea levels that could eventually render some densely-populated coastal areas uninhabitable. Extreme weather events including floods, droughts, heat waves, forest fires, sandstorms, and mudslides—which today affect several hundred million people—are predicted to become more frequent and more intense. Agricultural productivity is predicted to decline on some continents, especially Africa and South Asia, at a time of rapidly-growing demand for food, threatening the success of USAID's food security investments.

By 2050, the combined climate impacts of warming and acidification (the gradual decrease in the pH of the Earth's oceans, caused by their uptake of carbon dioxide from the atmosphere) on oceans is projected to result in classification of nearly all coral reefs as threatened, impacting reef fisheries and the roughly 500 million people for whom reef ecosystems provide crucial protein.

If we are unable to meet such challenges, climate change could jeopardize many of the development gains



Photo courtesy of Julie Kunen

Julie Kunen

the international community and the U.S. Government have worked for many decades to secure.

The Agency's Climate Change and Development Strategy was created to try to ensure that the potentially devastating effects of climate change can be mitigated, and that the countries where we work build up their resilience to unavoidable negative impacts. The process has not been taken lightly.

For the past nine months, I have chaired a small Policy Task Team (PTT) that has worked to articulate USAID's objectives and priorities in this area. Members of the PTT were selected for their areas of expertise, including in clean energy, adaptation to climate impacts, and reduction in greenhouse gas emissions from forests and other lands. They come from a diverse array of bureaus and offices and represent a true cross-section of the Agency.

As the team began to define the desired scope and priorities for the Agency's work, it soon became clear that a “dual-track” approach was needed. First, the strategy had to include strategic objectives for USAID's dedicated programs in the two primary areas of

climate change work—mitigation of greenhouse gas emissions and adaptation to climate change impacts.

Second, and equally important, it had to promote the integration of climate change considerations into USAID’s development work broadly. Taking climate change into account is simply good practice. Core development programs can build climate resilience and favor lower-emissions approaches, especially in “climate-sensitive” sectors such as agriculture, forestry, energy, water, health, and disaster management.

For example, in the agriculture sector, analysis of weather and climate data drive good practices and good decision making, including crop selection; ensuring sufficient water is available at the right time; designing infrastructure that provides reliable access to markets; and evaluating import and export balances.

As of early July, the draft strategy is nearing its final stage. It has gone through a number of expert consultations, followed by a rigorous interagency comment process, and will soon be presented to USAID Administrator Rajiv Shah for his approval.

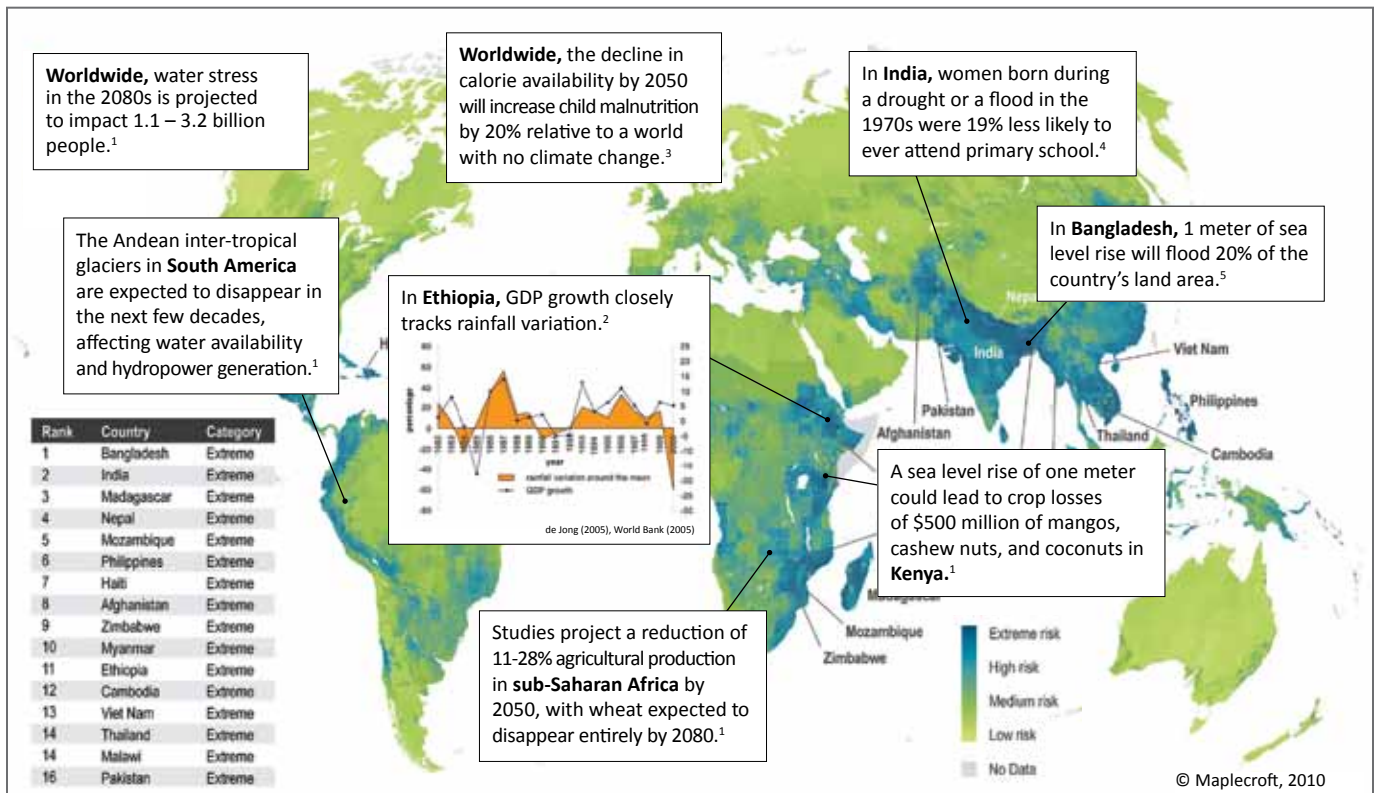
But nine months from when it began, the process of truly integrating climate into USAID’s work is just beginning. Broad and effective integration will require new training for officers, practical tools to enable field staff to design and implement programs, and the development of best practices based on testing approaches and learning from these experiences.

USAID’s new Climate Change and Development Strategy recognizes that climate change is not its own sector. It must not treat the issue as an environmental problem to be dealt with only by climate scientists, while the work of the

rest of the Agency continues without regard to its impacts. Instead, through this strategy, the Agency is seizing a course of action that will fundamentally change the way USAID does business.

In keeping with USAID Forward, the Agency’s reform agenda, the strategy explicitly recognizes the need to maximize learning from USAID’s climate change investments so that the Agency can develop a robust set of practices for the integration of climate change considerations across the development portfolio. By the end of this strategy, these practices will be mainstreamed into USAID’s approach to development through a variety of changes to program design, policy, strategic planning, and training. ■


*Julie L. Kunen is senior adviser and chief of staff in USAID’s Bureau of Policy, Planning, and Learning.*



Map reference: Maplecroft, 2010

For larger image and references, go to [www.usaid.gov/frontlines](http://www.usaid.gov/frontlines).



A close-up photograph of a young boy's legs and feet as he walks on a dry, reddish-brown dirt path. He is wearing worn-out, grey sneakers with significant damage to the soles. In his right hand, he carries a large, clear plastic bottle filled with water. The background is blurred, showing other children in school uniforms walking in the same direction. The overall scene conveys a sense of hardship and the impact of drought in a rural area.

A Kenyan school boy wearing worn out shoes carries a plastic bottle filled with river water as he heads back to school on August 17, 2009. In Kenya, a bruising and recurring drought profoundly affects the livelihoods of rural farmers. Many farmers in the region have abandoned the land to produce and sell charcoal or break stones in a nearby quarry for a local construction company.



# The Specter of “Climate Wars”

The science and practice of analyzing the interaction of climate change and conflict is new and evolving. There is little certainty over exactly how climatic change will manifest in specific locations or its consequences for economic development, political stability, and peace and security.

*By Cynthia Brady*

**I**N 2007, MANY in the advocacy community rushed to categorize the conflict in the Darfur region of Sudan as a “climate war” in the wake of a compelling United Nations report that emphasized the ways climate change and environmental degradation can drive conflict.

In 2009, international media focused significant attention on an academic study that analyzed historical linkages between civil war and temperatures in sub-Saharan Africa and suggested there would be a 54-percent increase in armed conflicts by 2030.

In both cases, subsequent research and analyses conducted by prominent scholars countered those original claims

of such direct climate and conflict connections, at least based on existing evidence. Those studies are two examples of the recent spate of analyses on the subject and serve as cautionary tales against alarmism and overly simplistic assumptions about specific connections between climate change and stability.

The reality is far more complicated.



The science and practice of analyzing the interaction of climate change risk and conflict risk is new and still evolving. As a result, there is little certainty over exactly how climatic change will manifest in specific locations and what the consequences will be for economic development, political stability, and peace and security.

Around the world, climate change likely will create both risks and opportunities, making it critical that development and relief organizations like USAID consider climate change not as a monolithic threat but rather as an important influence within a complex web of environmental and social factors.

Responding to climate change effectively means taking action to reduce the threats. It also means harnessing opportunities by helping people and institutions to effectively cope with and adapt to change—environmental or otherwise. Climate-focused interventions, if conducted strategically and with sensitivity to local context, can produce outcomes for conflict prevention and sustainable development as well.

For example, recent USAID-funded research in the conflict-prone Karamoja region of northeastern Uganda found that engaging local communities in the design and implementation of climate change adaptation activities—for example, promoting shared grazing areas and creating small-scale irrigation systems—holds considerable potential to reduce conflict by building social cohesion and addressing feelings of marginalization and disempowerment among local community members.

Since 2008, USAID has invested in research to better understand how specific climate factors contribute to the risk of conflict and affect the resilience

of social structures and institutions. The goal is to build a deeper understanding that will enable the Agency and its partners to respond most effectively to climate-related stress, reduce the risk of violent outcomes, and maximize the potential for U.S. foreign assistance to prevent conflict and promote stability.

This knowledge also will help USAID make wise investments as part of meeting U.S. Government commitments under the Global Climate Change Initiative as described in President Barack Obama's September 2010 Presidential Policy Directive on Global Development.

**THE RESEARCH** thus far points to climate change as an exacerbating factor in situations where political, economic, and social stresses already exist. The risk of conflict is greatest where there is poor governance and low institutional capacity.

The Agency, through its Office of Conflict Management and Mitigation (CMM), has identified two basic scenarios under which climate change could combine with other variables and potentially lead to conflict.

First, climate change could intensify existing environmental or resource problems. For example, a series of droughts could reduce the available local water supply, aggravating competition between farmers and pastoralists in already arid regions. Second, climate change could create new environmental or resource problems that contribute to instability. Changing rainfall patterns, for instance, could damage agricultural production in formerly fertile areas, decimating local livelihoods and causing food insecurity.

There is a third area of potential risk for USAID and other donors as well:

namely, that climate-related financing, policies, and programs which have not adequately considered local conflict dynamics and context could produce serious unintended negative consequences.

Climate change-related interventions such as incentive payments to stop deforestation—particularly in fragile states and conflict-affected areas—must recognize that both the money and the power to allocate benefits may inadvertently reinforce the social status quo, shift local power balances, or expose governance failures.

In her field work in Nepal, Janani Vivekananda, a researcher with USAID partner International Alert, recently illustrated how certain types of assistance might inadvertently do harm. She explained how a now-defunct village water tap installed in an effort to mitigate the effects of climate variability, did not appropriately consider the local social, political, and conflict context or even basic environmental parameters. In the end, it contributed to local grievance.

The community had requested the tap to be installed during a period of water stress and three consecutive years of drought. The Government of Nepal sponsored the project just before the elections.

Vivekananda explained: “These people are hand-to-mouth farmers. They didn't know and they wouldn't know that ground water levels were falling. They wouldn't know the negative impacts of uncontrolled surface water extraction and so they chased about this tap, and within three months it ran dry. That was the only cash that was injected into the community for development purposes, and it had no impact whatsoever apart from being a stark reminder



that the government itself isn't doing what it ought to."

This story highlights the reality that local context will define the outcome of peace or conflict and, thus, as CMM's discussion paper "Climate Change, Adaptation, and Conflict: A Preliminary Review of the Issues" noted, there remains a pressing need for a more robust, fine-grained understanding of the interaction between climate change and the political, social, and economic realities of conflict-prone areas.

To help fill this information gap, USAID is supporting field-based climate change and conflict research in Peru, Uganda, Ethiopia, and the Niger River Basin in West Africa. At the global level, the Agency is improving its ability to integrate climate change considerations into conflict early warning models. It is also establishing academic and practitioner partnerships that explore a wide range of environment and security issues.

Today, close to 60 percent of the State Department's and USAID's foreign assistance goes to 50 countries that are in the midst of, recovering from, or trying to prevent conflict or state failure. A significant amount of that assistance is slated for Global Climate Change mitigation and adaptation programming. Yet, as CMM's conflict early warning specialist, Kirby Reiling, observed, "much of that money could be a lost investment if those countries fall into armed conflict."

With conflict-sensitive development assistance and with smart climate change policies and programs, vulnerable countries will have enhanced opportunities to build stronger societies and more resilient institutions for sustainable development, peace, and security. ■

## PFAN

*continued from p. 7*

Since 2009, RDMA and PFAN have established networks in the Philippines, Indonesia, India, and China as well as a regional financing network across Southeast Asia. During this period, more than 100 projects have been mentored by PFAN and presented to Asian investors, and 21 projects in six countries have received financial commitments that will allow them to proceed.

As of this June, PFAN activities in Asia had leveraged more than \$274 million in financial deals for renewable energy and energy efficiency projects based on a \$3.4 million USAID investment. Combined, these are expected to provide 138 megawatts of clean energy and eliminate the equivalent of 12.2 million metric tons of carbon dioxide over project lifetimes—equivalent to taking 2.3 million cars off the road for one year.

"By any measure, the PFAN model is a very effective use of USAID resources," says Yates. "PFAN works. We should take this model and run with it." ■

*Peter du Pont is chief of party, ECO-Asia Clean Development and Climate Program—an RDMA implementing partner. Orestes Anastasia is a regional environment adviser at RDMA.*

## PFAN Facts

PFAN has assisted small businesses in six Asian countries to access financing for their clean energy projects that mitigate greenhouse gas emissions. Some of these successful projects include:

- A facility in Thaklong, Thailand, that will turn 350 metric tons of municipal waste per day into biogas and synthetic gas, which can be burned to generate electricity;
- A plant to procure power and heat from waste at a tapioca plant in Kampong Cham province, Cambodia;
- Generators at a steel mill in North Sumatra, Indonesia, that will use local agricultural waste to produce power for the operation of the mill and the surrounding community;
- A mini-hydro power plant in Pakkat District, North Sumatra, Indonesia, that will provide clean power, stimulating economic growth in an under-served region of the country; and
- A multiple-feedstock system in Quezon province, the Philippines, that will convert organic waste from a local pig farm and agricultural waste from local farmers into power and fertilizer.

Asea One first got involved with PFAN during a forum in Singapore in March 2009 designed to help companies gain access to financing. PFAN mentors provided coaching and helped refine the company's business plan. As a result, the project won first place in the business plan competition at the Philippines Clean Energy Investor Forum later that year, and received \$30 million from investors soon thereafter. In December 2009, Philippines President Gloria Macapagal Arroyo presided over the plant's groundbreaking in Aklan province.

# Your Voice: Peru's Melting Glaciers Teach Community “to Be Strong in the Face of the Changes”

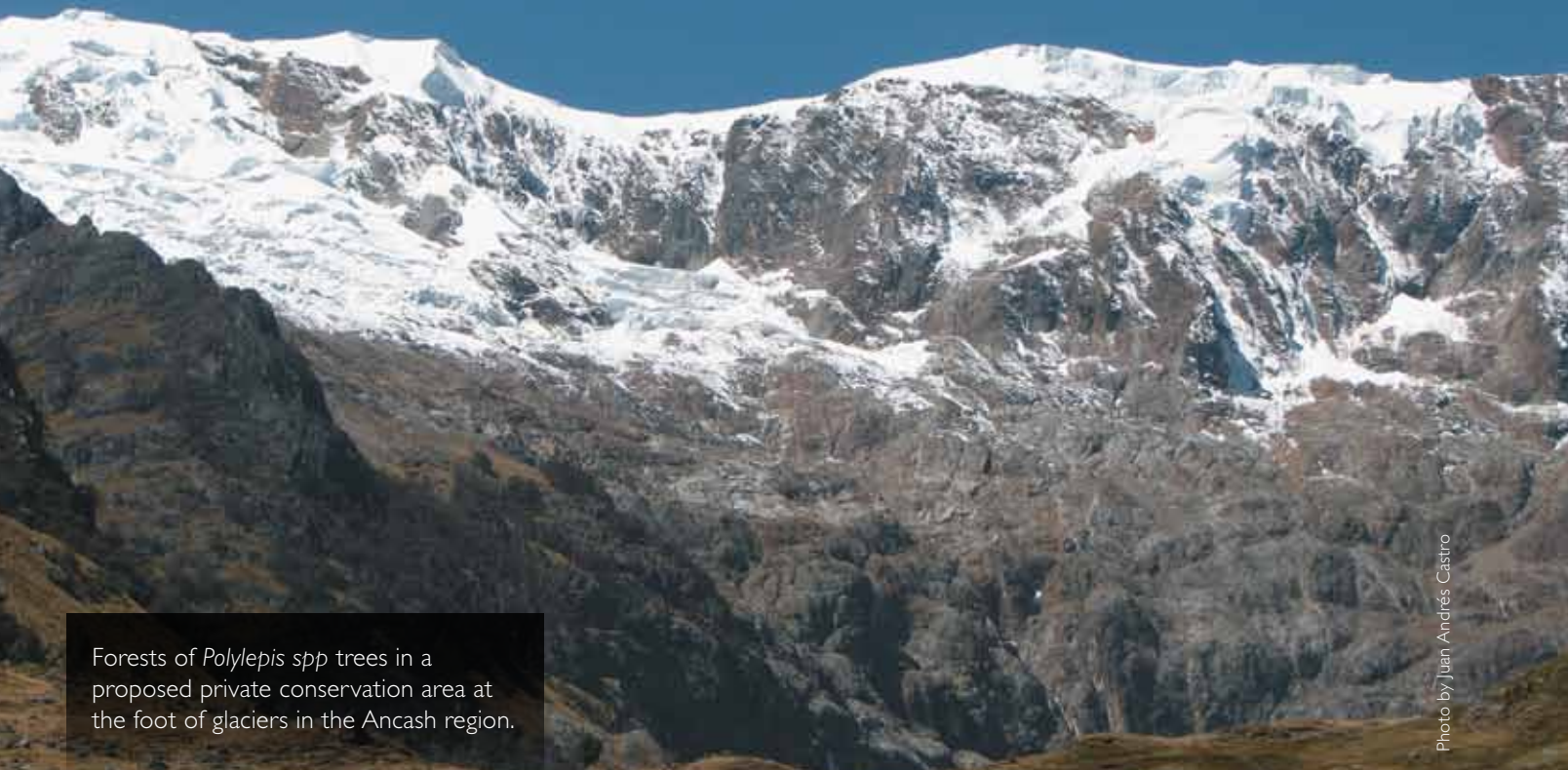


Photo by Juan Andrés Castro

Forests of *Polylepis spp* trees in a proposed private conservation area at the foot of glaciers in the Ancash region.

**By Nora Ferm**

Your Voice, a continuing FrontLines feature, offers



personal observations from USAID employees. Nora Ferm is a climate change specialist in the Bureau for Economic Growth, Agriculture and Trade.

**T**RAVELING FROM the heights of the Andes Mountains down to the Peruvian coast on a narrow dirt road hugging the cliff, I see firsthand the many uses of the Santa River.

I start the trip at 10,000 feet above sea level—almost twice as high as Denver—driving with colleagues from The Mountain Institute (TMI), a partner of USAID in Peru and Nepal. At that altitude, the river is fed mostly by runoff from the glaciers up on the peaks of the *Cordillera Blanca*—the White Mountains. Smallholder farmers in the highlands rely on the river to nourish their potato and corn fields.

A few hours later, after passing through countless dark tunnels carved into the rock, we are in a landscape dominated by dry rock and dust. Few houses can be seen, and the water rushes through a pair of large hydroelectric dams. By evening, we are at sea level, passing irrigated plantations with asparagus and other crops for export.

Throughout Peru, farmers and communities like these depend on water originating up by the glaciers. But as climate change increases global greenhouse gas emissions, temperatures are rising, rainfall is becoming increasingly erratic, and the glaciers are melting faster.

Seventy percent of the world's tropical glaciers are in Peru. Scientists once thought that these glaciers would be gone in 30 years. That timeline is being revised based on recent evidence, and some now estimate that all Andean glaciers will be gone in a decade.

Climate change impacts on glaciers and rainfall patterns will be felt all along the Santa River, and throughout the region, home to about 1.6 million people. Electricity production from



hydropower will become less reliable. Water for drinking and irrigation will become increasingly limited. In turn, these changes will threaten development advances in the areas of health, food security, and economic development.

High in the Andes, the former mayor of the town of Huasta described the crisis they are facing.

“Before, the Cordillera Blanca had a lot of snow, but now they just look like craggy rock,” he said. “Four or five years from now, we won’t have any more water. Those of us who live up at this altitude depend on the small springs and rivers. People on the coast have irrigation systems, which also use water that comes from up here. It makes me sad. If those streams disappear, what are we going to do?”

That is the question that USAID and The Mountain Institute joined forces in 2009 to address. TMI is an international non-profit that promotes conservation and community development in mountain ranges around the world. The two organizations are helping people in both the highlands and the lowlands of Peru prepare for and cope with the changes in climate and water availability.

This collaboration was made possible through the Development Grants Program, which was developed in 2008 at the request of the U.S. Congress to expand the number of direct partnerships that USAID has with U.S. private voluntary organizations and indigenous local NGOs.

Through it, Peruvian farmers and local government representatives get a better understanding of the threats posed by climate change and the role that ecological systems can play in helping them respond to these threats. High Andean wetlands and grasslands—like

*páramos* and *punas*—are critical for conserving increasingly scarce water resources, because their sponge-like soil and vegetation help capture water and feed local streams.

In workshops and trainings, community groups have learned how they are vulnerable to climate change, including the fact that it may become harder and harder to access water. They have also learned what they can do to adapt, such as preserving important natural systems. Now, these groups are working with their local governments on plans to restore and protect the forests and grasslands. At high altitudes, the native *Polylepis* trees—sometimes

called paper trees because of their papery bark—are particularly important for capturing water.

“We can feel the changes in the climate,” said Rosalía Jara, who lives in Huasta. “For instance, in previous years it rained continuously, but now the rains are infrequent and it is really hot. The springs have dried up, water is scarce, and the soil is less fertile. We need to get smart. We should conserve the highlands, especially the paper trees. I have seen that where there are forests of paper trees, there is water. I think this is a good way for us to be strong in the face of the changes.”

*continued on p. 21*



Photo by The Mountain Institute

A community forestry group in Ancash, Peru, prepares to reforest with native *Polylepis* or “paper” trees.





Students plant trees in Central Kenya.

## *In the Face of Change, Kenyan Farmers Learn to Adapt*

*The Agency is helping those susceptible to floods, droughts, and famine increase productivity, generate new sources of revenue, and become more resilient in the face of a changing climate*

**W**HEN THE RAIN stops falling in Kenya, catastrophe strikes. The year 2009 hit the African nation with its worst drought in over 25 years. Crops were wiped out,

entire herds of cattle killed. Farmers and livestock herders could no longer provide enough food for their own families, let alone the 23 million people across East Africa facing critical food and water shortages.

As a result of increased temperatures in the Western Indian Ocean, rainfall patterns in the region are changing, resulting in 30 percent less rain during the growing season. Even slight increases in temperature on land are making the dry conditions worse for

farmers and herders by sucking coveted moisture from the soil. Crops and grasses become more difficult to grow. The higher temperatures also invite more and increasingly dangerous pests and diseases that affect people, livestock, and crops.

With much of East Africa's population dependent on rain-fed agriculture, the negative impacts are felt by all. Lower yields are increasing prices for staple foods, like maize, and reducing revenue from key Kenyan export crops, such as tea.

These effects of climate change are expected to worsen in coming decades, adding additional stress to an already vulnerable and conflict-prone region.



Rainfall is 10 percent to 50 percent below normal for this period in parts of Kenya. An estimated 2.4 million people are likely to require food aid.

USAID is meeting this complex challenge by helping East African farmers adapt their techniques to the changing climate to prevent these problems from reaching disaster levels. The Agency is also enabling farmers to mitigate rising temperatures through reforestation activities which, in turn, are providing them with much needed income, and helping to increase their resilience to the effects of climate change.

Leonard Manga and his wife Marion live near Isiolo in central Kenya. The lack of rainfall has made it difficult for them to grow maize, their staple crop. Recently, their traditional farming methods have resulted in low yields and sometimes even no harvest at all. But just last year, a USAID-funded project began teaching the Mangas and other farmers in the region a new set of conservation farming techniques called *Kilimo Hai*, or “Living Earth” in the local Swahili.

The International Small Group and Tree Planting Program is teaching farmers techniques like trapping rain water before it runs off, keeping soil moist, and reducing erosion so that soil nutrients are not washed away when the rain finally does fall. A seed loan program helps farmers acquire treated and certified seeds that help reduce the amount of pests in their fields.

After being trained in conservation farming, Leonard Manga and his family

decided to try it on their land. They divided their maize farming area into two equal quarter-acre plots, and used the conservation farming techniques on one plot and traditional farming practices on the other. Despite their initial skepticism, the results erased all doubt: The conservation plot produced twice as much maize.

But better technique alone is not the magic elixir to mitigate the effects of climate change. The program also focuses on sequestering carbon through reforestation.

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**With much of East Africa’s population dependent on rain-fed agriculture, the negative impacts are felt by all.**

Community groups plant trees locally and then sell the offsets generated by the carbon sequestered on the global carbon market. In Kenya alone, 52,000 group members have planted over 5 million trees. The carbon offsets derived from this work are sold on eBay and the revenue generated goes back to the farmers.

The carbon offsets have just been certified by the Verified Carbon Standard and the Climate, Community and Biodiversity Alliance, two highly regarded certifications for carbon offsets. “This dual certification was one of the first in the world and was possible because of USAID’s continued support,” says Kit

*continued on p. 22*



Leonard and Marion Manga in their conservation farming maize plot.

Photo by Martin Weru, TIST

## Q&A with Sen. Patrick Leahy (D-Vt.)



**FRONTLINES:** What is behind your interest in the environment and climate change?

**SEN. PATRICK LEAHY:** I come from a state that has a long history as a leader on environmental stewardship. Vermonters have always put a premium on protecting the environment, and we are also outward looking. Vermonters understand that we do not live in isolation. The destruction of forests and pollution of the atmosphere and oceans affects us no matter where it occurs. Over the past two decades, as chairman or ranking member of the State and Foreign Operations Subcommittee, I have traveled to many countries where forests and wildlife are being destroyed, glaciers are melting, and water is becoming scarce, while populations increase. We are facing a global environmental crisis that may be catastrophic for future generations, yet many in Congress

seem unknowing or uncaring about it. For the sake of my grandchildren and for the planet, and I think we should be confronting it with more thought, action, and urgency.

**FL:** As chairman of the State and Foreign Operations appropriations subcommittee, how do you see climate change affecting long-term development strategies?

**Leahy:** If current warming trends continue, many countries will experience dramatic changes, including countries that already face acute food and water shortages. The growing demand for energy in developing countries—often from fossil fuels—and the deluge of impoverished people from rural to urban areas seeking jobs, are compounding the problem. Climate change may well cause large population shifts that governments are unprepared for, and accompanying instability and conflict. All of this and more needs to be part of our dialogue with other donors, governments, and civil society organizations about their development challenges and choices.

**FL:** How do you respond to Congressional colleagues who doubt the seriousness of the threats posed by climate change?

**Leahy:** The Earth's climate is changing. We can debate the causes, but no

one can credibly deny that it is happening. Even slight changes in temperature can have dramatic effects, especially for food production and the availability of water. In our daily lives we all see abundant examples of the human footprint on our planet. It only stands to reason that so much activity for so long would have some cumulative effect on the rest of nature, and on us. There are many examples of it already, and to those who doubt it, I can only urge that they talk to people, including in parts of our own country, who are already experiencing it.

**FL:** What's the prognosis for climate change or clean energy legislation in the 112th Congress?

**Leahy:** Not good. When some in Congress will stand in the way of any legislation unless it weakens regulations on drilling or mining for fossil fuels, it is hard to be optimistic. But there are some things we are doing, and will continue to do, in the State and Foreign Operations Subcommittee, where Democrats and Republicans work together to provide funding to protect tropical forests which absorb

huge amounts of carbon, and to promote renewable energy in developing countries. It is a small commitment of resources compared to what is needed, but it does make a difference. ■

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***We are facing a global environmental crisis that may be catastrophic for future generations...***



**Leading the Charge for Low-Emission Sustainable Development**  
*continued from p. 5*

with growing greenhouse gas emissions. Though considered a developing country, in 2010 it was ranked the 12th largest economy in the world. At the same time, it ranks 10th globally for carbon dioxide equivalent emissions.

“There is a huge potential for green growth in Mexico,” said Fernando Tude-la, Mexican deputy secretary for environment and planning. “We would like to prove that a developing country can mitigate and adapt to climate change without hurting the economy. We want to prove that in Mexico.”

Generally speaking, EC-LEDS seeks to build upon existing climate change-related strategies. In Mexico’s case, the government sought out U.S. assistance to help develop a mid-term strategy that builds upon and strengthens the PECC, ultimately enabling the country to transition from design to implementation.

As one example, USAID supported the development of software and provided training for a state-of-the-art electronic system called Carbon Counts to monitor Mexico’s progress in implementing the actions laid out in the PECC and to track resulting emission reductions.

USAID is also helping Mexico identify which actions might be attractive

for private sector investment. “Our earlier programs [such as support for Carbon Counts] have laid the foundations for our future EC-LEDS work in Mexico,” said Kay Freeman, USAID/Mexico acting mission director. “We will support the Government of Mexico as it establishes a transparent system for monitoring, reporting, and verifying the country’s progress in reducing greenhouse gas emissions.”

“[EC-LEDS] is not only an integral part of the global effort to address climate change, but also a means of helping countries grow their economies, attract investment, encourage private

*continued on next page*



Photo by USAID

USAID helped the Government of Mexico identify opportunities for wind farm development in the state of Oaxaca, catalyzing \$2.5 billion in investments from the United States, Europe, and Mexico.



Photo by Rubén Ramírez Villeda

Forest management trainees practice fire control techniques at Sierra de Manantlan Biosphere Reserve, Jalisco, Mexico, as part of a USAID-supported program.

sector growth, and achieve long-term, sustainable development,” said Michael Yates, then-senior deputy assistant administrator for USAID’s Bureau for Economic Growth, Agriculture, and Trade at an event on the margins of the 2010 U.N. climate change negotiations in Cancun, Mexico.

Batten says the EC-LEDS program is “central to what we do [at USAID].” She emphasizes it as a key component of USAID’s first-ever Climate Change Strategy, which is nearing completion (see related article, page 8).

“We recognize the importance to development of reducing emissions and climate vulnerabilities, and of

incorporating climate change into USAID’s overall development portfolio,” Batten said at a recent workshop.

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**For more information on the U.S. contribution to fast-start financing, go to: [www.state.gov/oes/rls/rpts/faststart/index.htm](http://www.state.gov/oes/rls/rpts/faststart/index.htm).**

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“Through our development efforts, we want to build partner countries’ abilities to respond to the needs of their citizens,” she said, “and reduce poverty effectively and sustainably in a changing climate.”

Although its focus is on specific countries, the EC-LEDS program is

not limited by these borders. Another goal is to help build a shared global knowledge base on low-emission development. The United States is working with international organizations, leading technical institutions, and bilateral and multilateral donor agencies to ensure that LEDES-related programs are complementary rather than duplicative, and that they leverage the resources and expertise of other agencies and programs.

Incorporating lessons learned in Bangladesh, Mexico, and other initial partner countries, the program will work to develop partnerships on LEDES with 20 countries by 2013. ■



**Your Voice: Melting Glaciers**  
*continued from p. 15*

USAID HAS ALSO supported training for mayors and local government representatives. After learning more about climate change, mayors in the Ancash region were inspired to create the Three Basins Commonwealth, dedicated to cooperating on adaptation to climate change, local economic development, and the management of mountain ecosystems. Commonwealths are legal entities created to achieve higher levels of impact with public investments.

Fidel Rodriguez, a former municipal council member from the community of Pampas Chico, explained the decision to create the Commonwealth. “We can see that the changing climate is affecting the local economy. People don’t know what to do about it. The local governments face a big challenge: how to be leaders in the process, how

to implement the right public policies to promote the kind of development that is needed in the context of climate change. The mayors in the new Commonwealth are taking responsibility and leading the coordination of these efforts.”

Women who have been elected to the municipal councils have also established their own climate change network. Through USAID, they are trained and have opportunities to talk with rural women so their concerns and interests are reflected in local adaptation projects.

Meanwhile, on the coast, people are realizing that they depend on the mountain water to grow asparagus and other booming agricultural export crops. If farmers in the mountains use water more efficiently and protect the river by planting trees nearby, it will help guarantee a continuous supply of water for the plantations downstream.



Photo by The Mountain Institute

Fidel Rodriguez, former municipal council member

Cooperation with highland farmers is therefore a key part of adaptation plans being drafted by lowland water user groups. USAID will work with these coastal groups to develop mechanisms to incentivize conservation in high mountain areas. This could include incentive payments from agricultural businesses to poorer highland communities that agree to plant trees and protect water sources.

As a result of USAID’s work, small-holder farmers in the mountains will be able to continue to grow crops to feed their families. They may even have new sources of income from their efforts to protect the watershed.

USAID is working to analyze how these strategies are working in Peru and to use the information to help other mountain communities. And, Peru’s Catholic University has invited TMI to create a graduate level program on climate change, ideally, to educate the next generation of stewards of the mountain and all it has to offer. ■



Photo by Jorge Recharte, The Mountain Institute

Jurao Valley was dedicated by the community of Huasta for establishment of a private conservation area.



**Kenyan Farmers**

*continued from p. 17*

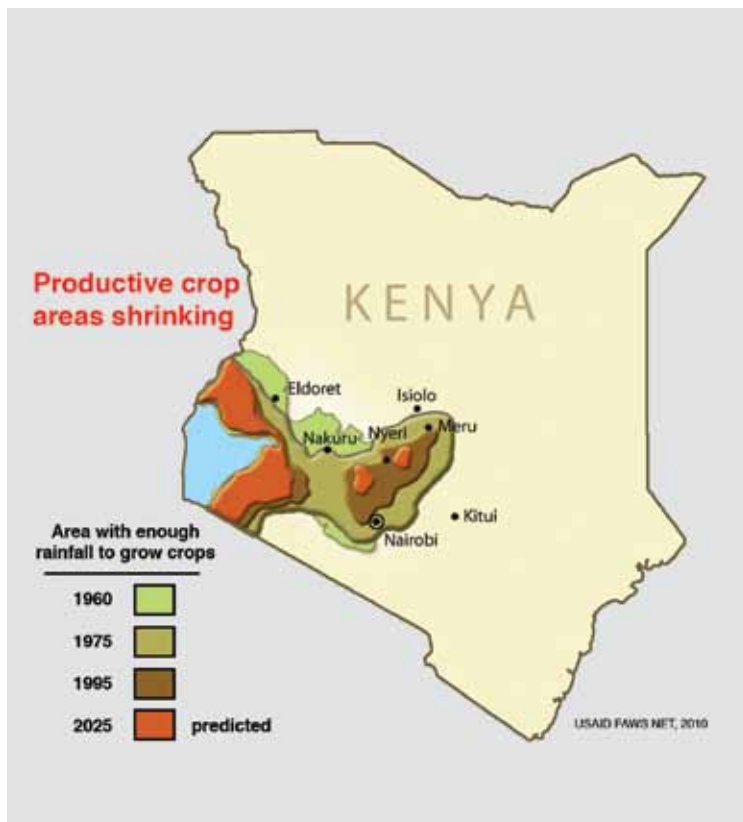
Batten, USAID’s global climate change coordinator. “Not only does this program help to fight and offset carbon emissions, but the additional source of income helps make farmers less vulnerable to the economic effects of climate change.”

**BACK IN ISOLO**, Leonard Manga and his family have started inviting neighbors who didn’t practice conservation farming to his plots.

“I want my area to become a famine-free area. Maybe one day they will recognize me and award me a Nobel Prize,” he jokes.

Manga and other farmers are grateful for the seed loan. “Besides planting high-quality seeds, which we couldn’t have afforded otherwise, the treated, certified seeds are attacked less by the worms, unlike the home seeds which are vulnerable to the attacks.” Manga plans to sell some of his crop to establish a tree nursery and to put all of his land under conservation farming next season.

Although the scale of the problem is daunting, the Mangas are confident that even as the climate continues to change, their new skills will help them weather the storm. ■



**FEWS NET: Weather Reports on Steroids**

As USAID works to give Kenyan farmers the tools they need to survive in a changing climate, the U.S. Government is also taking a big-picture look at the nation’s food security panorama, providing high-quality information on climate and weather patterns. But USAID’s Famine Early Warning Systems Network is no simple forecasting tool with maps.

FEWS NET, as it is better known, collects and analyzes a variety of indicators—from weather patterns to food prices to droughts to armed conflicts—from every part of the globe, and then provides reports that predict how all those factors will impact vulnerable populations.

Its purpose is to help key decision makers plan ahead of potentially devastating events that leave populations at risk for hunger and famine. The reports are routinely updated with the latest developments—whether for better or worse.

For example, this June FEWS NET warned again that the humanitarian response to hunger in the Horn of Africa has not been sufficient. The region may be best known for catastrophic droughts that killed thousands in earlier decades, and the problem has not subsided.

“More than seven million people in the sub-region need humanitarian assistance, and emergency levels of acute malnutrition are widespread,” the report said. “This is the most severe food-security emergency in the world today, and the current humanitarian response is inadequate to prevent further deterioration.”

In Kenya, findings show that temperatures have increased and the long rains have declined, shrinking the areas that can support farming.

FEWS NET, which is 25 years old, maintains offices and staff in nearly 20 countries, including Haiti, Afghanistan, and several African nations.

Anyone can follow its forecasts at [www.fews.net](http://www.fews.net).

For the latest updates on the Horn of Africa drought, go to: [www.usaid.gov/hornofafrica](http://www.usaid.gov/hornofafrica).

MESSAGE FROM THE  
Director, Office of Science and Technology

# THE GREAT DEVELOPMENT EQUALIZER

By ALEX DEHGAN

I'M thrilled that *FrontLines* has highlighted science and technology in this edition. The articles within it discuss the great leaps forward we have made as an agency in just over a year to restore science and technology to its rightful place. However, the new Office of Science and Technology at USAID, which I am extremely proud to direct, stands atop the shoulders of pioneering Agency scientists, technical specialists, and development visionaries who, early on in our history, made the Agency synonymous with game-changing, science-based advancements that improved the lives and livelihoods of millions around the world. We can restore that legacy again, and highlight the people at USAID who have continued that great work.

From our seminal role in introducing oral rehydration therapies, to promoting the eradication of polio and smallpox, to launching the "Green Revolution," the Agency boasts a storied legacy of science and technology accomplishments. This is a technical agency at its core, where science helps us characterize the challenges we face as a global community, or provides tools and research to address them.

Reflecting on these early milestones only spurs us on to achieve even more



Alex Dehgan, director of USAID's Office of Science and Technology, makes malaria smears of lemur blood from the southeast rainforest of Madagascar.

powerful science and technology breakthroughs to benefit those most in need. More than ever, today's quickly evolving science and technology developments—frugal innovations in medical

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**See [www.usaid.gov/ungalbreakthroughs.html](http://www.usaid.gov/ungalbreakthroughs.html) for examples of USAID's science and technology history.**

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diagnostics, life-saving vaccines, affordable off-grid energy sources, advancements in biotechnology, and fundamental research to increase agricultural yields with a smaller environmental footprint—hold the promise to make this a better world for all by cracking this century's toughest challenges.

The range of articles in this *FrontLines* edition mirrors the many ways USAID's science and technology push is making a difference: from tackling today's toughest development challenges at their critical constraints (*Grand Challenges for Development*) to accelerating life-promoting product development with NASA (*LAUNCH*) and boosting agricultural productivity, to re-building internal science and technology capacity; and from addressing over-the-horizon global trends (*Futures*) to using the latest tools and applications for spatial mapping and analysis (*the GIS Repository*).

However, this edition includes merely a handful of the science and technology initiatives and efforts that the Agency is commanding. Going forward, the real challenge will be to ensure that USAID continues to be the global leader employing science and technology to transform development and to empower 6 billion development experts to ultimately render development assistance obsolete. I hope you will join us in making USAID's second half-century every bit as legendary as our first. ■

*Alex Dehgan is science and technology adviser to USAID Administrator Rajiv Shah, and director of the Agency's Office of Science and Technology.*

# What Counts as Innovation?

By Steven Gale

THE DEVELOPMENT lexicon is abuzz about innovation—which is quickly getting top billing on development blogs and digital bulletin boards. Innovation is also the focus of high-level Organization for Economic Development (OECD) ministerial meetings, World Bank reports and UNESCO workshops. And it is a key pillar of USAID Forward, the Agency's reform campaign.

Not to be outdone, academia has issued a host of policy and white papers while business schools churn out case study after case study on innovation products, approaches, and business models. Everyone is asking the same question: What is innovation, what drives it, how do we accelerate it, and what new platforms promote it?

But exactly what does innovation really mean? It depends on who is answering. A recent Google search for the term “innovation” yielded 300 million hits. Is innovation only about applied science and technology? What about the latest wireless technology from Rwanda that alerts isolated local health clinics about infant HIV/AIDS blood test results from central labs and now connects 75 percent of the country's 340 clinics, covering a total of 32,000 patients? Or is innovation also about just improving ongoing business processes?

A common description for innovation is that it is the introduction of a new idea, product, method, service, or approach that leads to significant, not just marginal, improvements.

According to experts, innovation also can be an old good or service, so long

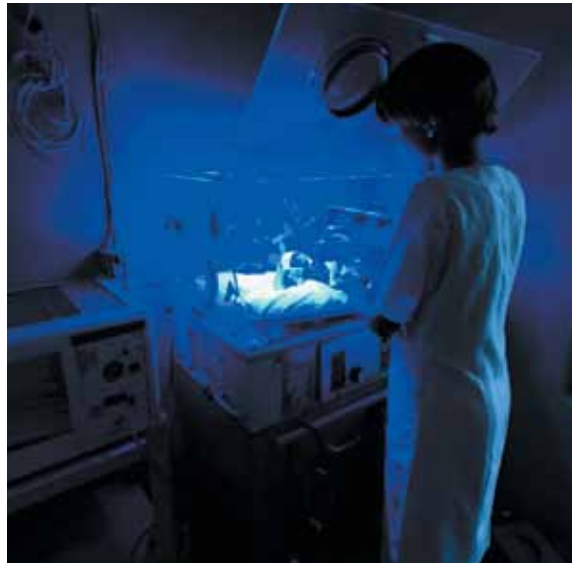


Photo by Ben Cline, D-Rev

A baby is treated by D-Rev's Brilliance device in a neonatal care intensive unit in Ogbomoso, Nigeria. The low-energy device uses strategically placed, high-intensity blue LEDs to treat severe jaundice in newborns. This photo won third place in the November 2010 *FrontLines* photo contest.

as it has a fresh and novel use. A first-generation cell phone in Bangladesh that now allows for e-mobile banking is an innovation because it is being used for something other than just talking.

But not every new product or idea is automatically an innovation. To be innovative, the product or service must actually be used—not just a concept or a

proof-of-concept. Plus, the way USAID thinks about innovation, according to Maura O'Neill, USAID's senior counselor for innovation, it is also a question of scale.

“Innovation is about producing substantial improvements—not just incremental ones,” she says.

More than ever before, innovation is critical to reaching the billion or so people today who still live on less than \$1.25 a day—with close to 380 million living in sub-Saharan Africa alone.

Organizations like USAID want to be hotbeds of innovation themselves, but increasingly they also want to leverage the largest set of thinkers possible to tackle a problem—an approach called “open innovation.” It's based on the premise that solutions are no longer bounded within institutional, commercial, or donor “walls” or “silos.” Open innovation is a seismic change in thinking and anchored to the fact that knowledge is now widely distributed across oceans, countries, disciplines, and donors, as well as among experts from developed countries and those from resource-poor ones.

The growth of the Internet, the use of prizes and awards, a team approach to solving problems, and venture-capital markets all contribute to the amazing upsurge in open innovation approaches to achieve development success.

O'Neill put it this way: “We know that great ideas and development breakthroughs come from all different places—a lab in a university, an indigenous person who has deep local knowledge, or a passionate entrepreneur.” But often, she adds, it is “a combination of different



people and organizations working together in new ways to create a way to identify and grow innovative ideas.”

USAID is focused on finding ways to identify, replicate, and unleash advanced products and technological breakthroughs that help reach development goals quicker, cheaper, more effectively, and with lasting impacts. The Agency’s Development Innovation Ventures (DIV), for example, helps identify

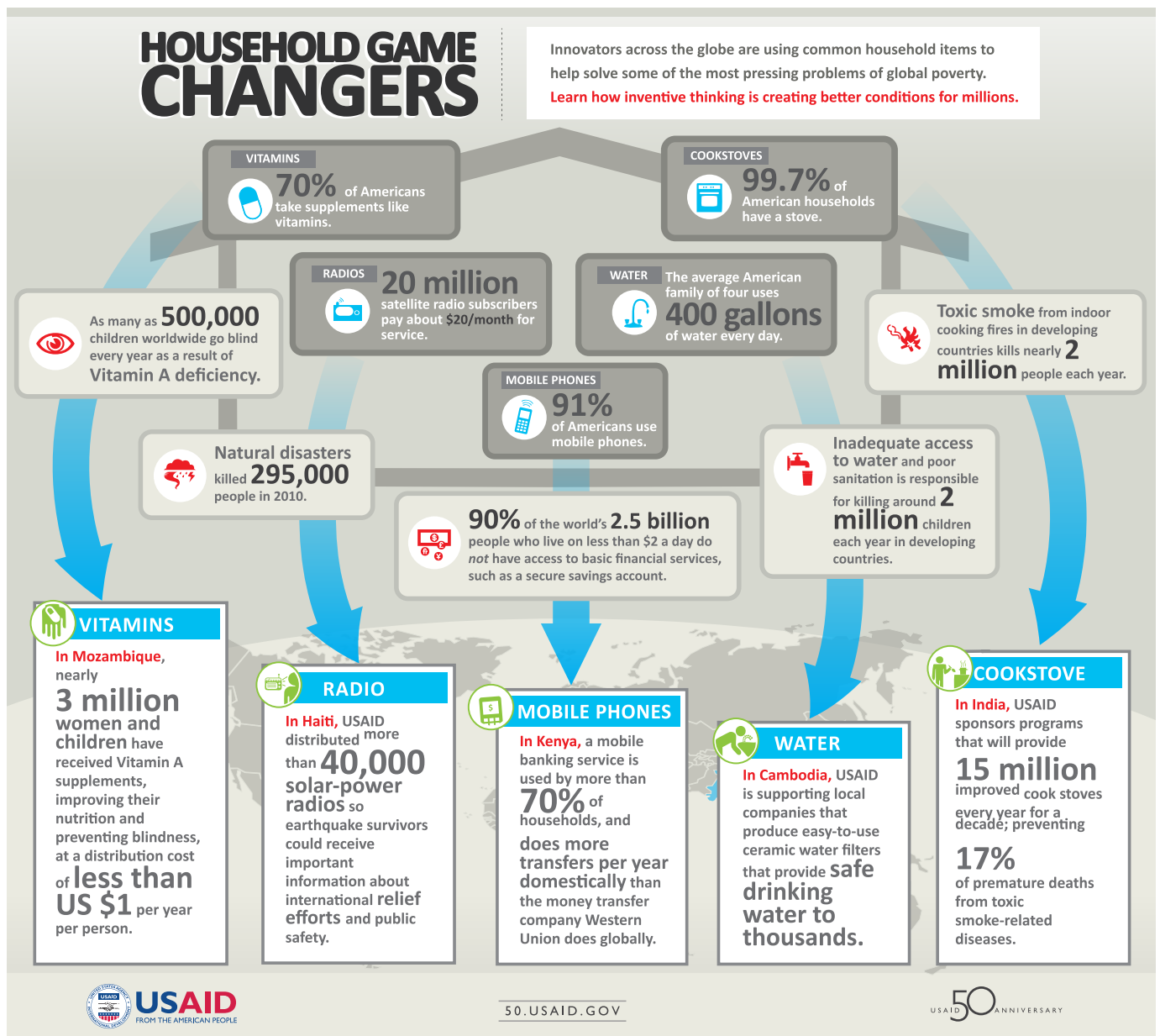
and accelerate the development of innovations that have the potential to reach 75 million people worldwide.

DIV, O’Neill goes on to say, “brings together diverse individuals from academia, the private sector, and NGOs to develop, rigorously test, and ultimately scale up promising approaches to improve the lives of the poor around the world.” DIV encourages advancement in all sectors from economic growth, to

agriculture, to anti-corruption, to health promotion, and to better governance.

But DIV is just one of USAID’s efforts to be both innovative and support a revolution in development thinking (see article on Grand Challenges for Development, page 36) In the past, innovation has sometimes been seen as something only by, and for, the developed world. But some of the world’s

*continued on p. 41*



For larger image, go to [www.usaid.gov/frontlines](http://www.usaid.gov/frontlines).



James Onyango, KAVI lab technologist

Photo by Vanessa Vick, courtesy of IAVI

# Collateral

## How the Pursuit of

*In 1999, the Kenya AIDS Vaccine Initiative was founded by local scientists with the goal of developing a vaccine that would block infection of the strain of HIV most prevalent in Kenya. Just over a decade later, the USAID-funded and International AIDS Vaccine Initiative-supported center has established itself as a model for developing country research institutions, capable of rigorously and ethically evaluating AIDS vaccine candidates and playing a crucial role in the global quest for the vaccine.*

*By Helen Thomson*

**N**UMBERS can be misleading. Take the recent hiring of 10 people by a couple of clinics operated by the Kenya AIDS Vaccine Initiative (KAVI) in Nairobi.

Given that Kenya has a population of 41 million and an unemployment rate that was above 40 percent last year, the recruitment of a doctor, data clerk, six nurses, and two lab technicians might seem inconsequential. But what it signifies for Kenya's future in scientific research and technological innovation would qualify as something of a splash.

# Benefits:

## *an AIDS Vaccine Has Boosted African Research*

These hires are supporting new research projects at KAVI's two clinics—one in Kangemi, the other at the sprawling Kenyatta National Hospital in Nairobi. The trials all started in the past six months and are run entirely by local staff. They include two Phase I HIV vaccine trials (see info box, page 42) supported by the International AIDS Vaccine Initiative (IAVI), through USAID, and one clinical trial examining treatment for a sexually transmitted disease, or STD. All three trials will be conducted concurrently by KAVI.

At the same time, KAVI's scientists are conducting three pioneering research projects to explore immune responses in the tissue where HIV establishes a beachhead in the early phases of infection. All of this work is in addition to ongoing studies looking at the epidemiology and clinical course of HIV infection that the Kenyan scientists have long conducted with IAVI's support.

Together, the nearly simultaneous launch of the new trials and studies amounts to a remarkable vote of confidence in the capabilities of the African researchers, and a tribute to the painstaking work—funded in large measure by USAID—that has gone into building a highly skilled team of experts in the field.

"It is very gratifying to see how our joint efforts over the years to build capacity for AIDS vaccine research are paying off," said Dr. Gloria Omosa-Manyonyi, medical manager and

principal investigator at KAVI. She has been with the initiative since its inception.

Getting to the point where a true transfer of skills and technology is taking place has taken time and effort, but not because the scientists who founded KAVI in 1999 were new to HIV research.

Omu Anzala, KAVI's program director; Walter Jaoko, the deputy program director; and the late Job Bwayo, co-founder and director, had already made names for themselves in the field. In partnership with colleagues at the University of Manitoba, they identified and studied sex workers in Nairobi who appeared to be highly exposed seronegatives—a rare subset of people who are free of HIV infection despite apparently frequent exposure to the virus.

By the late 1990s, Bwayo and his colleagues became interested in developing AIDS vaccines. Their hope was to develop one that would block infection by a strain of HIV most prevalent in Kenya.

At the same time, IAVI—which just marked its 15th year of operations—wanted to develop vaccines that were relevant to people everywhere, particularly those in the developing world, home to the majority of HIV infections. This would require establishing reliable research centers in developing countries capable of rigorously and ethically evaluating AIDS vaccine candidates. Because its interests coincided

with those of the Kenyan researchers, IAVI suggested in 1999 that they join forces to evaluate one of the world's first HIV vaccine candidates against one particular strain, clade A.

KAVI, the subsequent partnership, was born in 2001. A year later, the organization began the first AIDS vaccine trial in Kenya, evaluating a pair of vaccine candidates. While these candidates failed to generate immune responses strong enough for IAVI to continue their development, the studies were well conducted.

"We had faith in KAVI's ability to conduct these studies, though that confidence wasn't always shared by others," said Gwyneth Stevens, IAVI's director of clinical laboratories in Africa. "Some people in wealthy countries have a certain attitude toward the developing world: things just can't be done quite as well in those places."

**INSPIRED BY** its work in Kenya, IAVI began setting up partnerships for AIDS vaccine development in other countries. With the active support of funders, most notably USAID, IAVI worked with its research partners to build and refine research capacity. KAVI became the first site in what is today a highly sophisticated network of 11 IAVI-sponsored clinical research centers dedicated to testing AIDS vaccine candidates and conducting related HIV research in Kenya, Uganda, Zambia, Rwanda, and South Africa.





Dr. Gaudensia Mutua, principal investigator and medical manager at KAVI-Kangemi

“Our program,” said Stevens, “has shown that given the right support, research labs in developing countries can work at standards as high as any you’ll find in the U.S. and Europe.”

The Kenyan trial also illustrated the important role training can play in vaccine development. If academic science thrives on sudden inspiration and back-of-the-envelope calculations, clinical product development depends on audit trails and standardized procedures.

“We had until then just done basic research,” said Bashir Farah, KAVI lab manager. “The way you do basic research is different from how you run clinical trials—[in basic research] you can change your experiments midway and try any number of different things until you get your answer. But in clinical trials you have to follow protocols. We had to get people used to this and to understand that we were aiming for certain standardization.”

Standardization, mainly through adopting a rigorous set of operating procedures and attaining international laboratory accreditation, became particularly important as IAVI began sponsoring vaccine trials and HIV research across Africa.

This emerging capability is no accident, but a basic tenet of USAID’s and IAVI’s approach to AIDS vaccine research in developing countries. In the last year, KAVI’s researchers and technicians have trained 140 people, including staff from the laboratories of the U.S. Centers for Disease Control and Prevention in Kisumu and Nairobi, and are currently training another 30 researchers from Sudan, Uganda, Ethiopia, and Rwanda working with the Drugs for Neglected Diseases initiative.

The development of an AIDS vaccine remains one of the greatest scientific challenges of our time, mainly

due to the extreme mutability of the human immunodeficiency virus. If history is any guide, success in this endeavor is invaluable to the global campaign against AIDS. There are an estimated 34 million people living with HIV and, each day, an additional 7,000 people are newly infected by the virus.

“Based on all we have learned from tackling polio and eradicating smallpox,” says David Cook, IAVI’s chief operating officer, “we know that our best hope for curbing and eventually ending the AIDS pandemic, which has already claimed nearly 30 million lives, is through the deployment of HIV vaccines. I can think of few things as worthy of public support.”

After climbing steadily through much of the past decade, total global funding for AIDS vaccine research and development flattened out at \$868 million in 2008 and 2009. As always, the U.S. Government provided the most substantial portion of that support—nearly \$650 million in 2009, largely through the National Institutes of Health (NIH) and USAID.

Researchers working on an AIDS vaccine have made significant strides in the past couple of years. In late 2009, U.S. military and Thai researchers announced that a candidate vaccine regimen they had assessed in a large clinical trial provided 31 percent protection from HIV. The protection was modest—not enough to seek regulatory approval—but it was the first demonstration in human studies that a vaccine can prevent HIV infection, and it generated considerable excitement in the field. Researchers around the world are today racing to improve upon those results.

At the same time, scientists have made major breakthroughs in the applied

science of AIDS vaccine design. Just weeks before the Thai results were announced, researchers at IAVI and in the Neutralizing Antibody Consortium (NAC) it oversees reported in the journal *Science* that a highly collaborative effort involving some 1,800 HIV-positive volunteers, two biotechnology companies and research centers—including KAVI—in 11 countries had resulted in the isolation of a pair of novel antibodies capable of neutralizing a wide spectrum of HIV subtypes. These powerful antibodies hold important clues to the design of a potentially powerful AIDS vaccine.

Since isolating those first two broadly neutralizing antibodies, IAVI and NAC researchers have discovered 17 new antibodies from blood samples gathered through their global hunt. Meanwhile, researchers at the Vaccine

Research Center of the NIH have independently found a set of other such antibodies. The two teams are collaborating on these discoveries to design entirely new prototypes of AIDS vaccine candidates. Not only is an AIDS vaccine possible, but researchers now have the tools to understand what a vaccine must do in order to stop the virus.

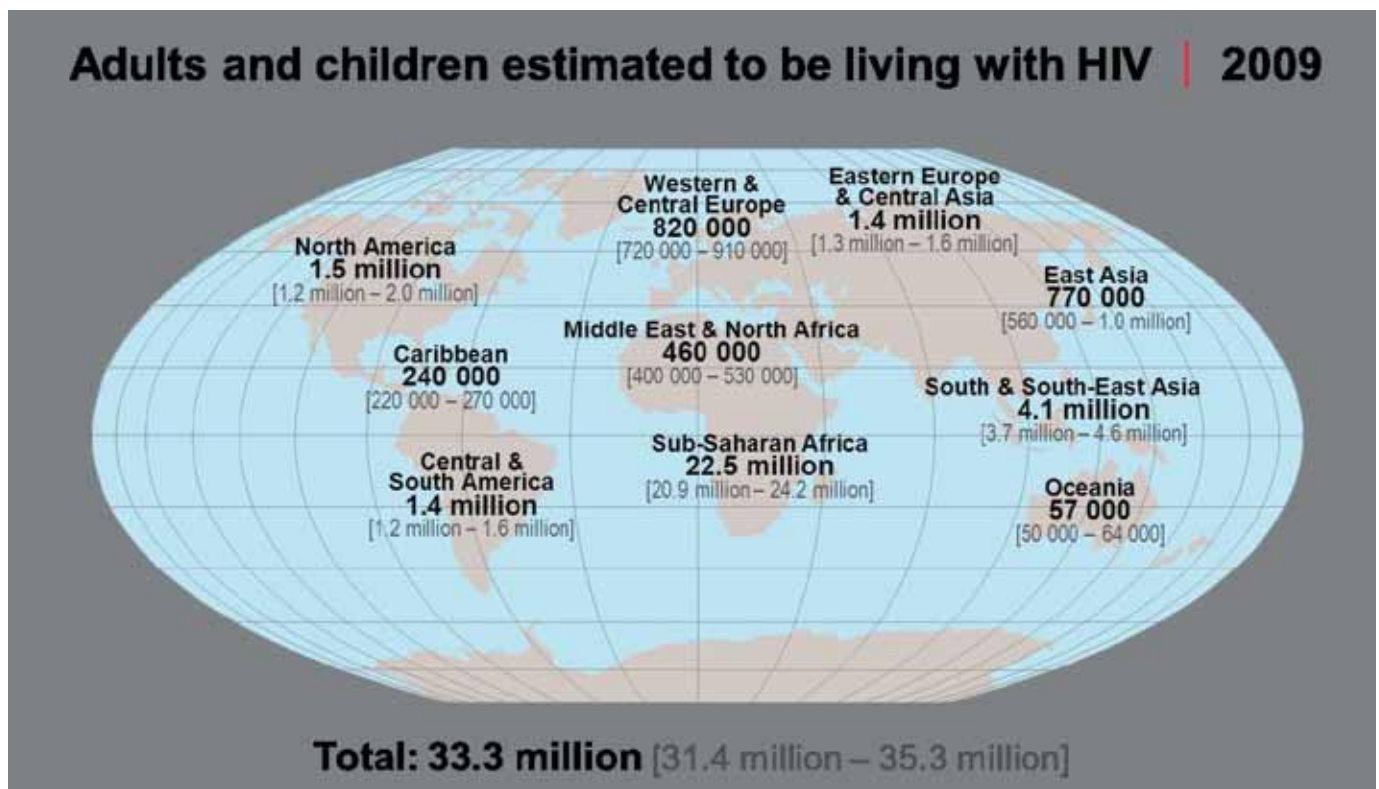
TO DATE, KAVI has completed four Phase I trials and one Phase II trial of candidate AIDS vaccines, and is in the midst of two additional Phase I studies. It now plans to capitalize on this experience to become a stand-alone research institute within the University of Nairobi—one that works with a broad portfolio of partners to conduct health intervention research, and perhaps leads to even greater residual effects on society.

“Strengthening scientific and technical capacity in the developing world has the potential to stimulate economic growth, particularly if new jobs are created that build local economies,” said Margaret McCluskey, senior technical advisor for HIV vaccines at USAID. “KAVI has been able to extend its work beyond HIV vaccine research and to develop partnerships with organizations addressing a variety of other health issues of importance to Kenya.”

As the search goes on, KAVI is also working with IAVI to make a name for itself in the arena of mucosal immunology. Immune responses located in the tissues where the virus enters the body may play a key role in preventing HIV infection from taking hold.

Being able to detect and measure immune responses on mucosal surfaces

*continued on p. 41*



Source: UNAIDS



Photo by USAID

Dr. Shakimurat Ismoilov inspects a patient's X-ray for signs of damage from a delayed MDR-TB diagnosis.

## 99-Minute Diagnosis:

# Will New Technology Turn Tide on TB War?

By Taylor Briggs

**I**N HIS OFFICE in Kazakhstan's National Tuberculosis Institute, Dr. Shakimurat Ismoilov is quick to recall his latest encounter with multi-drug resistant tuberculosis (MDR-TB)—the country's fastest growing and most dangerous epidemic.

"Just this morning, I examined two patients who had MDR-TB for three years and didn't know it. They infected their children and other relatives.

MDR-TB is just not easy to diagnose, and the test isn't fast. These patients didn't have many symptoms, and initial TB tests were negative." Unfortunately, Dr. Ismoilov, the chief MDR-TB physician in his facility, can easily think of many similar patient stories.

"Another patient of mine first noticed symptoms in March 2010, but she wasn't referred for a TB diagnosis by a doctor until August. Then, it wasn't until November that we were able to diagnose her with MDR-TB, and she finally

went on MDR-TB treatment in January. If she had been diagnosed earlier, she might not have developed these huge cavities in her lungs."

Dr. Ismoilov holds up this patient's X-rays to show the ravages of tuberculosis: the large holes grow larger with each successive X-ray, taken in the months leading up to and after her diagnosis.

Tuberculosis is an airborne contagious disease: when someone with an active infection coughs, sneezes, talks, or spits, tiny TB bacteria, called bacilli,



are released into the air and can be inhaled by others. While anti-TB drugs have been successfully used to treat and cure TB for the past 50 years, roughly 1.8 million people still die annually from the disease, many of whom are between the ages of 15 and 45, the most economically productive age group.

Effective TB control requires that patients who are infected with the disease take their medication regularly and finish their treatment, which takes between six to eight months, in order to prevent drug resistance. In the past few decades, resistant and difficult-to-treat strains of TB have emerged in different parts of the world, but perhaps nowhere like in the former Soviet republics. MDR-TB treatment takes an average of two years to treat.

In the 1990s, the breakdown of Central Asian health care systems after the collapse of the Soviet Union created gaps in screening and treatment of the disease, which led to growing cases of TB and its drug resistant form. The economic and social turmoil of the time further complicated efforts to adopt an effective strategy to tackle the growing pandemic.

Today, 20 percent of the global MDR-TB burden is in the World Health Organization (WHO) European Region, which has 15 of the 27 high-burden MDR-TB countries in the world, including the five Central Asian Republics. In the region, less than a third of the estimated cases are being notified because of the lack of diagnostic capacity.

Although TB cases, and specifically, cases of multi-resistant strains, are rising in Central Asia, one of the easiest ways to stem the spread of the disease

is through faster diagnosis. In the region, USAID and partner organizations are working together to introduce one of the latest technological advances in TB diagnostics: GeneXpert.

This new technology, which is compact and easy to use, is able to rapidly and accurately test for TB, including strains of TB that are resistant to the most effective anti-TB drug, rifampicin. No advanced training or sophisticated laboratory infrastructure is required to use it, and perhaps most importantly, it is able to deliver results in less than 99 minutes. Patients can be diagnosed while they wait, and proper treatment can be started earlier, which could dramatically change case detection and successful treatment for many people.

In December 2010, WHO held an emergency meeting to develop recommendations on this rapid diagnostic. USAID has been involved in the development of technical guidance, as well as the plans for scale-up and introduction in several priority countries.

**TEN YEARS AGO**, TB was primarily diagnosed through X-ray screening and clinical examination. This tool, while needed, should not be the primary method for TB diagnosis because it is not a specific indicator of TB infection.

In 1997, USAID and the Kazakhstan Ministry of Health provided new equipment to health-care facilities across the country to strengthen a diagnostic method called sputum microscopy. In existence since the late 1800s, sputum microscopy works by using a microscope to look for TB bacilli in a patient's sputum. While preferable to X-ray screening as a priority screening method, sputum microscopy

requires trained laboratory staff and proper guidelines, takes a day to produce results, and is not very sensitive. This simple method also does not identify drug-resistant strains of TB. For that, the patient's sputum must be further tested, which can take months.

The time lag between testing and diagnosis is a major contributor to the growing MDR-TB epidemic. In spring 2010, Zhenya M.\*, an IT specialist in his early 20s, started to feel ill. He tried to treat himself at home before finally deciding to see a doctor. The doctor at his local primary health care clinic took an X-ray of Zhenya's chest and then referred him to the TB hospital for further testing.

At the hospital, his sputum tested positive for TB, and he was sent to the section of the hospital for new TB patients. Over the following three months, further testing showed that the strain of TB that Zhenya had was not resistant to the main anti-TB drugs. But after nearly six months of treatment, he was still not feeling any better. At that time tests confirmed what everyone suspected: Zhenya's TB had become resistant to the treatment. Nearly nine months after he began to feel sick, Zhenya was finally placed on an effective drug regime.

While he is feeling better now, Zhenya was forced to quit his job because of his prolonged absence and is still in the TB hospital receiving treatment. During his time in the hospital, it is very likely that Zhenya contracted MDR-TB from a fellow patient who was waiting for his or her results. Unfortunately, this situation is all too common, says Dr. Alma Akbayeva, deputy chief doctor of the regional

*continued on p. 42*

# BUILDING TRUE CAPACITY ON A SHIFTING DELTA

**A**T the Ganges-Brahmaputra-Meghna Delta, the largest river delta in the world, three churning rivers pour over the fault lines of merging tectonic plates, leaving behind over 1 billion tons of sediment each year. Most of Bangladesh sits atop this rapidly evolving landscape. The delta and its geological phenomena provide a large and rich field site for geology research, the kind of research necessary to be able to design infrastructure, reduce risk, and optimize resources to ensure the well-being and prosperity of the delta's over 200 million residents.

In 2010, lead scientist Michael Steckler of the Lamont-Doherty Earth Observatory at Columbia University and his colleagues—including several from other U.S. universities—received a five-year, multi-million dollar award from the National Science Foundation (NSF) for a project to expand their research on geology and geohazards in Bangladesh.

The project will support multiple trips of U.S. scientists and students to Bangladesh, where, as part of their research, they will continue and expand

their network of seismic stations and systems for recording data. Ideally such an endeavor would include substantial resources from Bangladeshi counterparts. However, despite years of experience working the region, the U.S. team began the project with very limited resources from their host country



Bangladesh is situated at the juxtaposition of the Ganges-Brahmaputra-Meghna river systems, which drains an area of 1,086,000 square kilometers from China, Nepal, India, and Bangladesh. The unique geophysical location provides a rich site for geology research.

collaborators due primarily to lack of funding and inadequate training.

One of the local collaborators on the Bangladesh project is Syed Humayan

Akhter, a geologist at Dhaka University. Though he is working with the NSF-funded team, his research still faces many resource limitations that are common among scientists in the developing world. For a country with significant earthquake potential, Bangladesh sorely lacks capacity and expertise in seismology.

Although this NSF-funded project and other previous efforts have established seismic data collection stations throughout Bangladesh, faculties at regional universities merely host the equipment and are unable to make adequate use of it despite an interest in doing so.

Some of these deficiencies will be addressed by a small USAID-sponsored grant. With it comes the promise of greater collaboration between the U.S. scientists and their Bangladeshi counterparts. It is these types of collaborations that the U.S. Government would like to see repeated across the developing world.

**EACH YEAR** the National Science Foundation invests millions of dollars in research projects that support U.S. scientists and students to conduct research in countries where USAID works. However, as a

domestic federal science agency, the foundation's capacity to support foreign scientists is limited. This makes it difficult for U.S. scientists to form sustained collaborations and to build capacity at partner institutions in the developing world.

Without support for developing country counterparts, research projects seldom reach their full potential. "Host-country researchers are left standing on the sideline unable to fully benefit from training and networking opportunities while U.S. scientific teams are in country," says Mark Doyle, a fellow at USAID sponsored by the American Association for the Advancement of Science (AAAS).

Projects like "Reducing Parasite Transmission across a Varied Landscape: Ecological and Social Contexts of a Malaria Intervention" and "Hydrology, Ecology, and Pastoral Societies in the Sahel: Ephemeral and Perennial Water Resources in a Dynamic Coupled System," to name just a few recent NSF-funded endeavors, are consistent with USAID's work. In fact, NSF currently has projects in nearly every country where the Agency is active.

"Even so, the potential for collaboration and mutual gain between the two agencies has been grossly underexploited," says Doyle.

"The challenge," he adds, "is to identify the sweet spots where NSF research and USAID mission priorities intersect so that USAID can support local scientists and fully leverage NSF's investment to build research skills while at the same time meeting their development aims."

Akhter was one of those sweet spots. In January 2011, USAID made his Dhaka University team a small reward

as part of a package to scientists in USAID focus countries. The \$30,000 grant leveraged a \$4.5 million NSF award to the Columbia University team researching geohazards in Bangladesh. The money has already helped establish a new facility at Dhaka University serving as an in-country hub to store and process seismic data, and make the data available to other universities. The grant is also supporting training scientists from multiple universities in Bangladesh so that they will be able to use the seismic stations and the data hub for their own research and teaching purposes.

**AKHTER'S GRANT** was a curtain raiser of sorts. The award to the Dhaka geologist and five other small grants like it were a precursor for much more ambitious new programs to bridge NSF-funded researchers with their often resource-disadvantaged counterparts in the developing world.

The program, called Partnerships for Enhanced Engagement in Research, or PEER, sits where scientific research meets international development, leveraging the scientific rigor and resources of the United States in order to pursue broader international development goals in line with U.S. Government foreign policy objectives.

"NSF-funded scientists and students who undertake research in developing countries bring significant resources to the table, including expertise, equipment, and a desire to foster long-standing relationships with their foreign counterparts. For a relatively nominal USAID investment, developing country scientists and students gain access to some of the best scientists and educators in the U.S., all of whom

have competed successfully for NSF funding," says Alex Dehgan, director of USAID's Office of Science and Technology.

As with the pilot grant recipients, the PEER program will support competitively selected scientists and students in developing countries who are collaborating with U.S. scientists funded by NSF. It aims to engage host-country scientists and students on topics of importance to USAID and NSF such as food security, water, biodiversity, and climate change, and to build enduring relationships between researchers and institutions. It will provide opportunities to leverage NSF investments.

"It's clear that the PEER program is a win-win for both agencies," says DeAndrea Beck, a program officer in NSF's Office of International Science and Engineering. "NSF benefits because the U.S. scientists and students that we fund are able to achieve better research outcomes when their developing country counterparts participate as true partners in the research collaboration. And, because of these enhanced partnerships, PEER complements NSF's efforts to foster a globally engaged U.S. science and engineering community that has increased awareness of research questions that have relevance to the developing world."

Just a few months into his grant, Akhter's project now supports a geology center at Dhaka University used for training and data processing. In late May, he helped organize a five-day USAID-funded training workshop for members of the Bangladeshi geoscience community, with the U.S. collaborating scientists serving as facilitators.

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**I**N RURAL Malawi, each hospital serves hundreds of thousands of patients within a 100-mile radius. To reach remote patients, they rely on trained volunteer community health workers. It was at one such hospital that Josh Nesbit met Dickson Mtanga, a subsistence farmer and health volunteer. Dickson had to walk 35 miles to submit handwritten reports on 25 HIV-positive patients in his community.

And yet the information could have been transmitted via SMS messaging (cell phone-based text messaging) in 35 seconds.

In February 2009, Nesbit, Isaac Holeman, and a group of students from Stanford and Lewis & Clark universities founded FrontlineSMS: Medic. The organization would later become Medic Mobile and would begin to change the face of rural health care for thousands of people in Malawi and beyond.

# LAUNCHpad for Innovation

## *Can Texting Revolutionize Rural Health Care?*

*Since March 2010, a unique partnership led by USAID, NASA, Nike Inc., and the State Department has sought out and supported innovators and their creative technologies to help address major development issues.*

Maize test plants at DTI-r are growing with less than half the usual amount of water.

The mission would help health workers communicate, coordinate patient care, and provide diagnostics using low-cost, appropriate technology.

The project, dubbed LAUNCH, has received assistance from a unique government and private-sector partnership led by USAID, NASA, Nike Inc., and the State Department. Its goal is to identify, support, and help take to market creative technologies and other solutions that address global sustainability problems—especially those related to international

development. Medic Mobile is now working with another LAUNCH innovator—Ozcan Research Group at the University of California, Berkeley—to tie microscopes to cell phones to do field-based lab tests and send the tests to the clinics centrally.

Since its inception in March 2010, LAUNCH has assisted 20 such projects, many of which may be positioned for large-scale impact on international development challenges.

“It is always exciting and invigorating to work with new and innovative thinkers, and the LAUNCH: Health Forum was no exception,” said USAID Deputy Assistant Administrator for Global Health Amie Batson, referring to an event sponsored by the LAUNCH partner organizations, and held last fall at the Kennedy Space Center in Florida. “Having this kind of dialogue with the minds who are working on real-world solutions is an important role for USAID. This program, which puts innovators at the center, has paid real dividends not only for the participants. My Global Health colleagues and I have also continued to apply lessons and practices we took away from LAUNCH in our work at USAID, which was a somewhat unexpected result we really appreciate.”

Another project LAUNCH is helping bring to scale is dubbed the Root Hydration System, developed several years ago by Design Technology & Irrigation Ltd. with support from DuPont.

“Planet Earth has a total of about 326 million cubic miles of water—the problem is, virtually all of it is too salty or too polluted to irrigate plants and grow food or pasture with,”

explains LAUNCH water innovator Mark Tonkin.

Desalinating, filtering, and irrigating in one pass, the Root Hydration System has a piping network that is driven by the humidity gradient, making the system extremely water efficient while using virtually no power.

“At its core,” says Tonkin, “it is extremely simple.” The device consists of pipes made from active hybrid Duryon™ polymer material that are installed at root depth, and then filled with water—fresh, salted, or brackish.

The water permeates through the pipe walls from the wet side to the dry side, emerging as vapor, leaving virtually all the salts and contaminants inside, hydrating the plants’ root zone with clean water vapor.

The first semi-commercial trial took place in 2007 in the United Arab Emirates and was chosen to be an extreme test of the system—extreme temperatures, extreme lack of rainfall, and salty groundwater—and yet 200 prosopis trees still grew.

As this is a new technology, it will require new techniques and novel approaches. But the potential for using salted groundwater directly for irrigation is a benefit to water stressed regions which experts believe cannot be ignored.

**IN THE CASE** of Mobile Medic, results have been quick to show. In six months, the pilot in rural Malawi saved hospital staff an estimated 1,200 hours of follow-up time and over \$3,000 in motorbike fuel. Over 100 patients started tuberculosis treatment after their symptoms were noticed by community health workers and reported by text message.

The SMS network brought the Home-Based Care unit to the homes of 130 patients who would not have otherwise received care; and texting saved 21 anti-retroviral therapy monitors roughly 900 hours of travel time, eliminating the need to hand deliver paper reports.

In less than one year, Medic Mobile expanded from 75 to 1,500 end users linked to clinics serving approximately 3.5 million patients. Growing from the first pilot at a single hospital in Malawi, the organization established programs in 40 percent of Malawi’s district hospitals and implemented projects in nine other countries, including Honduras, Haiti, Uganda, Mali, Kenya, South Africa, Cameroon, India, and Bangladesh.

That is just the beginning for LAUNCH. The core team, made up of five people from USAID and NASA, has been selected as a finalist for the prestigious Service to America Medal in the science & environment category. The team is currently designing the third LAUNCH “cycle,” which will focus on energy. The LAUNCH: Energy Forum will be held at the Kennedy Space Center in Florida in late October 2011.

“USAID’s commitment to LAUNCH is a sign of our broader commitment to marrying the power of breakthrough science and technology solutions for international development with an open innovation approach that invites in and supports new solvers,” said Alex Dehgan, science and technology adviser to the USAID Administrator. “The large development challenges of the 21st century demand open innovation approaches like LAUNCH, and we will continue to refine and support them.” ■

# USAID's Grand Challenges for Development:

Going Head-to-Head to Solve Today's Toughest Development Problems

By Steven Gale

**M**ORE THAN a century ago, the noted German mathematician David Hilbert jotted down a list of the most compelling unsolved mathematical problems of his day. Solve these first “to lift the veil behind which the future lies hidden,” he said in 1900. Hilbert’s top picks were more than a simple “to-do” list for his mathematician buddies. They were a roll call of exactly which unsolved challenges were holding back real growth in mathematics and related disciplines.

Building on that very same idea more than 100 years later, the Bill & Melinda Gates Foundation announced a series of Grand Challenges in Global Health. The challenges were a “call for a specific scientific or technological innovation that would remove a critical barrier to solving an important health problem in the developing world with a high likelihood of global impact and feasibility.”

In short, Gates, like Hilbert, was looking for some chart-busting, best-selling, runaway successes that had eluded other problem solvers. Solving the health challenges, according to the foundation, would save millions of lives. Capitalizing on that same energy to bring about solvable solutions to today’s most daunting development problems is at the heart of USAID’s

Grand Challenges for Development. But more about that later.

Following on the heels of Gates, a group of pre-eminent agricultural scientists, academics, and researchers identified the “top 100 questions of importance” to the future of agriculture late last year. They noted that the most pressing challenge today is how to feed almost 9 billion people by the middle of this century. These experts, writing in the well-respected *International Journal of Agricultural Sustainability*, estimate that the world must produce 70 to 100 percent more food than it is doing now “in light of the growing impacts of climate change, concerns over energy, and regional dietary shifts.”

From a grand challenge perspective, these thought-pioneers are helping to define the new problems that must be faced, not just revisiting the decades-old goal of maximizing food productivity. In short, they are framing the next set of solvable agricultural grand challenges—like knocking down barriers to food access and distribution, minimizing volatile food price swings, and addressing dramatic changes in land use, urbanization and globalization—that will affect agricultural practices and impacts worldwide.

Grand challenges, as a term, is quite popular outside of the health and agriculture arenas and is often associated with not just one, but a series of competitions with sizable up-front cash awards. For example, the Defense Advanced Research Projects Agency (DARPA), part of the Department of Defense (DOD), has long tried to bridge the gap between innovative technologies and military use by offering big prize money to whomever can develop a long distance, off-road, driverless car seen by the DOD as vital for next-generation warfare.

And the ubiquitous photos of a bizarre array of antenna-loaded, wildly colored, robotic test vehicles bouncing mindlessly along a 150-mile test track in the Mojave Desert? DARPA’s latest grand challenge required these driverless robotic vehicles to cover a tortuous 60-mile urban track in less than six hours—and by obeying all traffic regulations. This kind of grand challenge also illustrates a known problem or goal by an organization, but an unknown, prescribed technical solution.

**BACK IN** March, USAID launched a Grand Challenge for Development—Saving Lives at Birth, the first in a planned series that will likely also take on education, agriculture, water, and energy. Saving Lives at Birth is laser-focused on saving mothers’ and babies’ lives during their most vulnerable period—from the onset of labor until 48 hours post-delivery. Responses to the multi-donor grant program that was announced at the time of the Grand Challenge for Development has been overwhelming with more than 600 approaches from public and private sources now under review (see “Saving Lives at Birth,” online). And, the really



big news is that close to quarter of these submissions come from developing countries themselves.

USAID's Grand Challenges for Development (GCD) are defined in areas where the Agency believes science and technology can play a transformative role in providing solutions. This is a more open approach to solving critical barriers to development because USAID is defining problems, not solutions. Funding will be targeted to those that bring new and different ways of overcoming these critical barriers. To achieve scaled impact, the Agency will support programs that have

the measurement and evaluation evidence of success in early implementations.

USAID will play an important role in elevating the focus and attention given to problem areas defined by the GCDs: convening the global community around the importance of solving the problem, sharing evidence and experiences, and fomenting solutions that work on a local level.

A successful GCD, says Alex Dehgan, director of USAID's Office of Science and Technology, "will have a catalytic impact by facilitating and sparking the actions of others." Not all

problems will become GCDs, says Dehgan, since the Agency's plan is to "identify only the largest, focused, solvable development problems that will be both scalable and sustainable—and have the greatest impact."

USAID's GCDs are a promising new way, as Hilbert might have put it, to lift the "development veil" to see a better future by mobilizing the needed global funds, intellect, innovation, and talent to improve the lives and livelihoods of the world's poorest people.

That's a challenge worth taking. ■



USAID Administrator Rajiv Shah delivers remarks at the March 9 launch of Saving Lives at Birth: A Grand Challenge for Development at USAID headquarters in Washington D.C.

Photo by Chris Kleponis, AFP

# Connecting the Future with the Present: **Foresight Research**



Photo by Jon Hrusa, Elizabeth Glaser Pediatric AIDS Foundation

A young girl tests out a new seesaw on a playground built by the Elizabeth Glaser Pediatric AIDS Foundation at the Mkhulamini Clinic in Swaziland. This year, the foundation will launch a USAID-funded, five-year program to expand services to prevent mother-to-child transmission of HIV.

*By Steven Gale*

**I**N Africa today, USAID is focused on ending malaria, preventing HIV/AIDS transmission, and curbing other infectious disease like tuberculosis, avian influenza, and neglected tropical diseases. But, over the next decade, non-communicable diseases (NCDs) like obesity, diabetes, and cardiovascular diseases—with common risk factors such as tobacco use, alcohol abuse, and over consumption of fat-rich diets—will be the next major health challenges facing the continent, said African ministers of health at a

meeting in Brazzaville, Congo, this past April. What was their rallying cry? “Unite against NCDs, the time to act is now.”

Other evidence suggests that Africa is midway through a demographic shift from high to low death rates—and birth rates—despite a decade or more of the devastating consequences of HIV/AIDS and other deadly diseases.

The emerging African middle class continues to grow, and over the next 20 years, according to experts, it will exceed those of India and China. This growth, combined with rapid urbanization, likely will force other changes

over the next decade or sooner. In less than 15 years, the majority of Africans will live in cities and towns, not in rural areas, demographers say.

What does this mean for those working to help African societies and economies develop? To stay ahead of the curve, development assistance needs to stay up on the latest trends so that strategies are not fixed in the past and programs are targeted for new challenges just over the horizon.

To do this right, the Agency must take a more systematic approach, and there is one tool designed to do just that—future trends analysis. This is

already going on in some parts of the Agency like the Bureau for Global Health and the Office of Conflict Management and Mitigation, but those are more the exceptions than the rule.

When it comes to rapidly changing landscapes, Africa is by no means unique; fast-paced development trends are occurring in Asia and Latin America as well. Dynamic trends are also emerging across sectors, not just geographic regions. Global transitions in basic education are underway with a growing shift away from classroom-centered and teacher-driven learning experiences to more online and interactive student-to-student and student-to-teacher exchanges.

In high schools here and abroad, students with computers and Internet access are using real-time “backchannel” digital streams, allowing them to participate in classroom discussions without ever having to raise their voices. Increased institutional networking among academic institutions and open networking will soon allow future students anywhere in the world to choose their own courses—maybe even design their own curricula.

Looking ahead to the near future, many development professionals are asking what today’s smart phones and e-readers will look like in a decade, will they even exist, and how will Agency strategies and programs in education, micro-finance, governance, and health be positioned to stay ahead of the development curve. Will partner country medical diagnostics be done at home, in local clinics, or “in the cloud”? Could the death and destruction caused by natural disasters be mostly avoidable through new technologies, tools, and advanced personalized

communications? And, will the power of social media, so much in the headlines today, wither, or will it actually become a major driver of a powerful new kind of citizen governance?

**TODAY’S DEVELOPMENT** challenges are more complex, involve more players, are more interactive, more networked, more interdisciplinary, and more global than ever before. If that was not enough, these challenges are moving at cyclonic rates compared to previous decades.

Alex Dehgan, science adviser to USAID’s administrator, framed the question of tackling impeding change this way: “If development is to make a lasting difference, USAID must marshal everything it and other institutions know about future trends to influence current development policies and strategies—and design and implement programs accordingly.”

That means that looking at development trends in population, migration, urbanization, food scarcity, and natural resource capacity, for example, is no longer a luxury exercise.

The disciplined analysis of identifying emerging development trends and examining their underlying causes goes by many names, but is more widely known today as foresight research.

With foresight research there is no illusion about predicting events five and 10 years out—let alone 20 years. At the same time, through serious trend analysis, organizations like USAID can reasonably identify signposts that suggest a certain direction seems highly likely or not. Even when the future is unknown, it is possible to engage in what is called “scenario

planning,” similar to what the military calls “war gaming.” Known facts about the future, such as the youth bulge that demographers have been warning about for years, and the steady rise in urbanization that geographers and others have carefully documented, are combined with plausible alternatives, such as the need for rapid job creation and responding swiftly to megacity demands. While any one scenario is unlikely, this exercise helps policy-makers anticipate new approaches and re-examine past assumptions. A few years back, USAID was among the pioneers in just this sort of scenario planning in an interagency-led program called Project Horizon, which brought together senior executives from the National Security Council and global affairs agencies to conduct whole-of-government strategic planning to confront a range of changing realities.

Understanding long- and longer-term trends can dramatically improve the probability that development programs will have their desired impacts now, in the short run, and hopefully over time. That’s why USAID has been actively exploring foresight planning and examining options to increase its internal capacity to make it happen.

The age-old adage that the “future depends on the past” has been up-ended in today’s development environment to read that “the present depends on the future.” Dehgan summed up the big challenge before the Agency this way: “As a premier development enterprise, we must open ourselves up to the possibility that the future could be very different from what we imagine today, and then we must act now on what we know.” ■



# ST&I for Sustainable Development

By John P. Holdren

**T**HE AIM OF development should be to improve human well-being in all of its major dimensions—not only the economic one but also environment and health, personal and national security, and civil society. The aim of sustainable development should be to achieve these gains in ways consistent with maintaining the improvements indefinitely.

The central relevance of science, technology, and innovation (ST&I) to these aims has long been clear.

Whether through the creation and distribution of improved crop varieties, the deployment of critical infrastructure for electrification and sanitation, or the delivery of modern medicines and vaccines, the efforts of scientists and engineers in industrialized and developing countries alike have been essential to progress in development.

Today, however, both the challenges and the opportunities around the application of ST&I to development are bigger than previously thought.

This is, in part, because the appropriate addition of sustainability to the criteria for success calls for greater understanding of and attention to the ways in which ST&I affects the environment, health, security, and civil-society dimensions of well-being.

Two recent insights about the nature of innovation are further reasons the challenges of ST&I in development are bigger than previously thought.

First, ST&I is not a “pipeline” in which investments in science and technology—and the associated generation of discoveries—necessarily lead to

successful innovation defined in terms of widespread application.

Instead, the pace of progress depends on a complicated set of feedbacks among science, technology, and innovation in which availability of capital at the demonstration and pilot phases, incentives for public-private-academic partnerships, the existence or absence of subsidies for incumbent technologies, and many other factors play important roles.

The second insight is that ST&I for development usually cannot simply be “exported” from industrialized countries to developing ones. Applying technological advances in developing countries generally requires the creation of a degree of relevant scientific, technological, and institutional capacity in the developing countries themselves.

While the challenges are great, so too are the opportunities. We now better understand the nature of the challenges. Recognizing what needs to be done in the way of attending to economy-environment interactions, providing for effective feedbacks between the different stages of innovation, and investing in indigenous capacity are essential steps. And there has already been much progress in these directions, above all in Asia and Latin America, but increasingly also in parts of Africa and the Middle East.

Another source of increased opportunity is the pace of recent progress in technologies with immense potential to help developing countries “leapfrog” over the conventional technologies that are too costly, too cumbersome, too inefficient, and too environmentally disruptive. These domains include nanoscience



John P. Holdren

and technology, genomics, advanced information and telecommunications technologies, and cleaner and more efficient technologies for energy supply and end-use.

The Obama administration recognizes this nation’s core economic, security, and environmental interests in sustainable development around the world, and it recognizes the interconnectedness of development’s economic and non-economic dimensions.

These insights are reflected in the administration’s foreign policy, security policy, development policy, and science and technology policy. With the help of Congress, our many international partners, and the private, philanthropic, and academic sectors, we are making good progress, and going forward we will make much more. ■

*John P. Holdren is the assistant to President Barack Obama for science and technology; director of the White House Office of Science and Technology Policy; and co-chair of the President’s Council of Advisors on Science and Technology.*

## Innovation

*continued from p. 25*

poorest communities have always been great innovators—making life-enhancing improvements out of ordinary products. Development experts are quick to highlight these home-grown innovations: using spinning bicycle wheels to power cell phones, creating makeshift solar cookers from spare metal siding, and using ordinary cell phones to corner up-to-the-minute market prices for locally grown agricultural commodities.

Under USAID's open-competition approach to innovation, anyone, anywhere in the world can apply for a DIV grant or submit a proposal for one of USAID's Grand Challenges for Development. Innovation, in short, knows no geographic boundaries.

Along with the broader term, you will likely hear the phrase "reverse innovation." This refers to the process where an innovation designed uniquely for the developing world finds its way back to the developed world with performance enhancements, not stripped-down features. These products create new untapped markets when they boomerang back to developed countries. Ultra low-cost laser eye surgery, hand-held, battery-powered cardiograms, tasty low-fat dried noodles, and the "Nano" car with a mind-blowing \$2,000 price tag are often cited as reverse innovations.

USAID continues to take the lead among donors to make innovation fundamental to its re-vitalized development goals and reform agenda. Steve Jobs, co-founder of Apple, summed it up nicely when he said "innovation distinguishes between a leader and a follower." ■

## KAVI

*continued from p. 29*

will become increasingly relevant to AIDS vaccine development, especially as vaccine candidates move to large-scale, efficacy trials.

"The fact that the KAVI team can do this level of very sophisticated science is more than just impressive; it's evidence that USAID's support of HIV vaccine research and development builds meaningful capacity—a cornerstone of sound and sustainable development. KAVI's expanded portfolio is a quintessential example of how applied research for one disease can translate into collateral benefits when employed to investigate solutions for other diseases of relevance to the region," said McCluskey.

IAVI is currently in the early stages of designing vaccine candidates to specifically elicit immune responses in the mucosal tissues that first come in contact with HIV. Research centers that test those candidates will have to be capable of consistently measuring them. In advance of these studies, IAVI staff trained KAVI researchers to collect and prepare mucosal tissue samples and use them to conduct highly standardized and accurate immunological laboratory tests, or assays.

"There has been a significant increase in both the scale of the work we do at the KAVI labs, and the kinds of tests and assays we conduct," says the lab manager, Farah.

KAVI hopes that all this groundbreaking clinical research will put it

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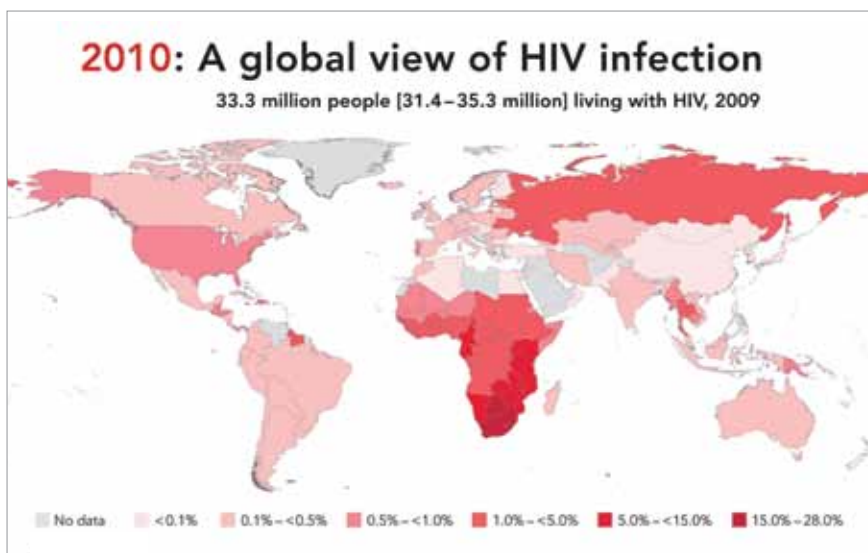
Bashir Farah, lab manager at KAVI

Photo by Vanessa Vick, courtesy of IAVI

on the map of both the study of vaccines and the human immune system, and help it become a center of excellence in HIV/AIDS research. Yet, for all its new ambitions, KAVI remains in hot pursuit of the trophy that inspired its creation: the development of an effective AIDS vaccine. That motivation isn't likely to go away.

"Africa continues to bear the brunt of the AIDS pandemic," said Dr. Gaudensia Mutua, the principal investigator and medical manager at KAVI-Kangemi. "It is only fitting that African scientists play a central role in finding a solution." ■

*Helen Thomson is clinical operation director for Africa, International AIDS Vaccine Initiative.*



Source: UNAIDS

For larger image, go to [www.usaid.gov/frontlines](http://www.usaid.gov/frontlines).

## HIV/AIDS Trial Primer

- **Phase I** trials enroll small numbers of people who are at low risk for HIV. The primary goal of these trials is to determine the safety of these products for human use.
- **Phase II** trials enroll larger numbers of people and may include some individuals who are at higher risk for HIV. These trials often yield additional data on safety and side effects, and on immune responses to the vaccine among a larger population.
- **Phase III** trials provide the most accurate test of whether a vaccine provides any protection against infection or disease. These trials generally compare the rate of infection in individuals given an experimental vaccine with the rate of infection in a group given a placebo, or a medicine that has no effect.

Source: IAVI

## 99-Minute Diagnosis

*continued from p. 31*

TB hospital. "Twenty percent of all new cases in my hospital are MDR-TB, and the slowness of MDR-TB diagnosis is a problem. If we could detect MDR-TB sooner, we could reduce the transmission of the disease."

SINCE 1998, USAID has partnered with WHO, the World Bank, the STOP TB Partnership, the Global Fund, and other global TB control initiatives to provide technical assistance, strengthen local capacity, and introduce innovative yet practical solutions to effectively prevent the spread of TB and MDR-TB.

In December 2010, when WHO issued a policy statement and roadmap for roll-out of GeneXpert, USAID Administrator Rajiv Shah welcomed the news. "Rapid diagnosis ... is critical to the early detection and treatment of TB ... USAID stands ready to support the roll-out of this new technology, including the advancement of sound international policy, training, and impact monitoring."

Quick diagnosis through GeneXpert—which was developed by the American company Cepheid—also significantly lowers the chances that a patient will contract MDR-TB in the hospital, like Zhenya probably did.

"USAID believes that hospital transmission is a major mechanism for the spread of MDR-TB in the region. The use of GeneXpert will contribute to early detection of rifampicin-resistant TB, as well as timely separation and appropriate treatment of MDR-TB patients," said Dr. Kairat Davletov, a USAID health specialist.

USAID's effort to implement this technology is part of a multi-pronged



## Shifting Delta

*continued from p. 33*

Photo by USAID

Patient Zhenya M. is undergoing treatment for MDR-TB but prefers to protect his identity due to the stigma associated with the condition.

strategy to counter the growing swell of MDR-TB cases in Central Asia. With the help of GeneXpert, it is hoped that far more people will be diagnosed with MDR-TB in a shorter period of time, and fewer individuals infected with MDR-TB will have to risk losing their health, time, and possibly their lives while waiting for a test result.

**AS USAID WORKS** with local and international partners to prepare for the introduction of GeneXpert in Kazakhstan and other Central Asian countries in the future, word is out that a new technology exists that can rapidly detect rifampicin-resistant TB, a proxy for MDR-TB. For some patients already infected with MDR-TB, the news is bittersweet.

“My doctor recently told me that there is a new diagnostic method to identify drug-resistance in less than two hours! If this tool had existed in 2010, I wouldn’t have lost so much time because I would have started treatment much earlier,” says Erik T. from east Kazakhstan, a patient with a drug-resistant strain of the disease.

Implementation of this new technology could not have come at a better time for patients and doctors alike. “We’re clinicians. We recognize the problem, and we see that there are more and more MDR-TB patients in our hospital every year. It would be invaluable to have GeneXpert here,” says Dr. Akbayeva. ■

*\*Last names of patients have been withheld to protect their privacy.*

This serves as an important first step in building a network of geologists in Bangladesh to integrate seismic data from across the country using the new data processing center at Dhaka University as a hub. The workshop also sets the stage for continued substantive interactions between participants and the U.S. team throughout the remaining four years of the National Science Foundation award and beyond.

“Bangladesh experienced major and great earthquakes in recent and historic pasts. But the country was lacking proper earthquake monitoring stations with trained personnel,” said Akhter recently.

“The NSF supported research projects established the backbone of earthquake study in Bangladesh but had little scope to foster the persons interested in seismology.... The timely grant of the USAID fund was a blessing and it both inspired and encouraged us to work hard for the development of [a] strong seismological community in the country.”

For USAID’s Dehgan, this last part, the inspiration and encouragement among scientists, is what makes the PEER program truly revolutionary. “Not only do the PEER grants provide the hardware necessary to do science, but they provide the “software”—the connections and intellectual exchanges between scientists from the U.S. and scientists from developing countries, that last long beyond the end of the grant.” ■

*For further information on PEER, contact Mark Doyle at [mdoyle@usaid.gov](mailto:mdoyle@usaid.gov).*

# What It Means to Think Spatially

By Shadrock Roberts

**F**LYING wildly around the earth and swooping at will into the cavernous depths of the Grand Canyon or along the dizzying edges of the Swiss Alps is a favorite past time of mine. Virtual globes such as Google Earth permit this infinitely enjoyable activity but surely must serve a more meaningful purpose than allowing me to visit the isolated beaches of Socotra, Yemen, when I should be working. So just what is their intended purpose? You may have heard that they're for "geovisualization" but what, then, is the deeper meaning of that?

Geovisualization is an emerging field that draws upon approaches from several disciplines such as cartography, information and scientific visualization, and geographic information systems (GIS) to provide theories, tools, and methods for the presentation of geographic—or spatial—data. In some cases this may mean creating data with coordinates from global positioning systems (GPS) and then using the established methods and tools to display them in print or digital form.

In other cases it may mean teasing out the geographic—or spatial—component of data that already exist, such as statistics about countries, cities, or administrative units, to allow them to be displayed on a map or in some other form that highlights spatial relationships. These relationships, in turn, can give us new insights into problems that we are trying to solve. Spatial thinking moves beyond asking *where* to asking *why*.

An example of the latter would be a geovisualization that I created for population data in Kakuma refugee camp, Kenya. I was investigating the relationship between demography and landscape change and had come by two data sets. The first was population estimates for portions of the camp as captured by a refugee registration database. The second was estimated locations, derived from satellite imagery, for all dwelling units, or shelters, in the camp. When the two datasets were combined and displayed in Google Earth, the resulting geovisualization allowed me to see some interesting relationships.

In some parts of the camp there was harmony between the two data sets: satellite imagery showed the greatest number of dwelling units in those portions of the camp with the highest reported population density. In other areas, however, radically different numbers of people were reported for adjacent sections of the camp showing the same number of units. This is useful information if, for example, you need accurate population data to calculate baseline health statistics.

The geovisualization revealed that the population data for the camp were more stable in some places than in others. And this question—why here and not there?—is the basis for the

field of geography. Investigating the social process behind the why is another part of finding out why some places are different than others.

The geovisualization I created for Kakuma could not fully explain the harmony or discord seen in the data. However, it could show where I need-

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**It's important to remember that thinking spatially doesn't require a computer, GIS skills, or even Google Earth.**

ed to investigate further. Taken in sum, this process of identifying and seeking to explain such phenomena is what we mean by "thinking spatially." It's about using the properties of location and space as a vehicle for structuring problems, finding an-

swers, and suggesting solutions.

**DEVELOPMENT IS**, inherently, a place-based activity: It takes into account the differences between places. We work in specific places for specific reasons. Our programs have spatial, or geographic, impact. The effects of a school, a road, or a well are meant to radiate beyond the physical object itself to affect humans and the spaces they inhabit.

By thinking spatially we can analyze socio-economic, demographic, health, education, agricultural, or environmental data to highlight spatial and temporal trends that are difficult or impossible to detect on spreadsheets or in official reports. By thinking spatially about our current and future strategies, programs and projects, we can increase our ability to target at-risk or neglected populations. And the presentation and

## THINKING SPATIALLY ABOUT DEVELOPMENT

communication of these observations can be enhanced and easily comprehended using geovisualization.

It's important to remember that thinking spatially doesn't require a computer, GIS skills, or even Google Earth. While all of these things can facilitate the process, thinking spatially starts with the brain. Noting the location of a stakeholders meeting or where people are traveling from to get there does not require technical tools, nor does wondering why a program works better in one area than another.

USAID can already boast some good examples of spatial thinking. It can be seen in projects such as the Famine Early Warning Systems Network—a data analysis system that looks at multiple

aspects of food availability and affordability in Africa (see FEWS NET article, page 22); and in a small number of missions and the Bureau for Democracy, Conflict and Humanitarian Assistance where there are dedicated GIS staff.

Increasingly, missions and bureaus say they are interested in geographic thinking and geospatial tools. Specifically, nearly half of USAID's missions have requested support for developing their own GIS centers. To this end, USAID is in the process of establishing a geospatial center that will serve as the focal point for the Agency on matters concerning geospatial information technology. This center will be used to implement mission-based

Geo-MIS—a hybrid integration of geospatial analysis and management information systems—to do spatial analysis, map visualization, GIS training, and, generally, to build the Agency's geospatial capacity.

By helping Washington and field staff “think spatially,” we expect to improve the overall planning, monitoring, evaluation, and communication of our development programs. Ultimately, we intend to make USAID an international leader in the application of geospatial information technologies for development. ■

*Shadrock Roberts is a senior GIS analyst with USAID.*



For larger image, go to [www.usaid.gov/frontlines](http://www.usaid.gov/frontlines).

© 2010, Google Earth



## The Great Data Warehouse

**W**HEN a crisis strikes, information about the affected areas—anything as basic as a road map or as complex as the spread of contamination in connected waterways—are needed within seconds. In these situations, aid workers and emergency responders do not have time to evaluate all possible datasets in a given area to generate such geospatial visualizations.

Since 2003, USAID has funded the Geographic Information Support Team

(GIST) Data Repository, the primary platform used to distribute spatial data and geographic resources required for spatial visualization.

The Data Repository, housed at the University of Georgia, is a global archive of these kinds of data collected and distributed for the greater humanitarian community including governments, the United Nations, and NGOs. Its purpose—strategically building and distributing geospatial products—significantly

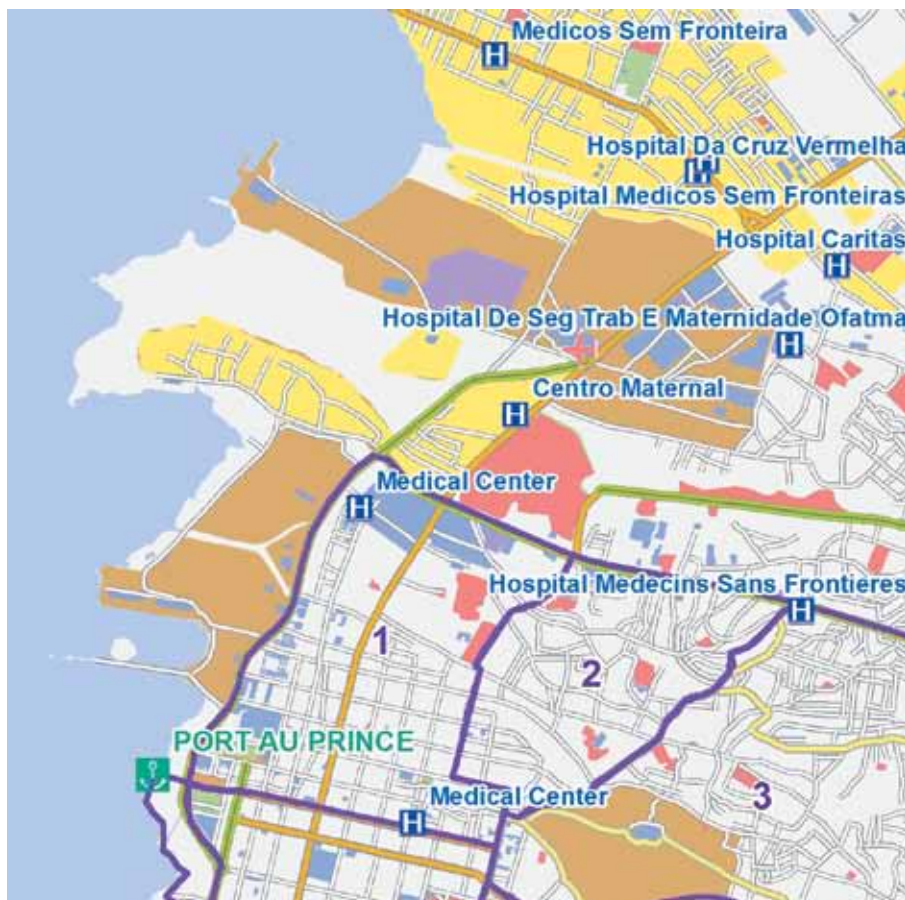
improves the ability of aid practitioners to deliver services.

For 10 years, the repository has been researching and learning from experience, gathering and analyzing data, sharing knowledge and resources with the greater humanitarian community, and creating an easy-to-use infrastructure that can deliver data anywhere.

In late 1999 and early 2000, GIST efforts in Kosovo following the war in the Balkans were recognized as having played a significant role in supporting the collection, coordination, and exchange of information to strengthen humanitarian assistance.

The Data Repository, one of several initiatives of the GIST, was the major actor in collecting geospatial data and information to assist in the relief efforts in Afghanistan; Democratic Republic of Congo; Southern Africa; and Iraq. Its current project is a crowdsourcing initiative in partnership with Information Management & Mine Action Programs, the World Food Program offices in Bangkok, and the GIS Corps to extract vector features from scanned atlas pages of North Korea, focusing on bodies of water, population centers, and transportation infrastructure.

Crowdsourcing is a particularly powerful tool, as it allows missions and the Agency to aggregate the creativity, intellect, and awareness of millions around the world. Such an affluence of knowledge can transform the work of development as it renders a more complete image of the situation at hand and provides an opportunity to receive exponentially more ideas for solutions. ■



The above figure, using datasets downloaded from the Geographic Information Support Team Data Repository, was created by the University of Georgia Information Technology Outreach Services following the 2010 Haiti earthquake.

## THINKING SPATIALLY ABOUT DEVELOPMENT

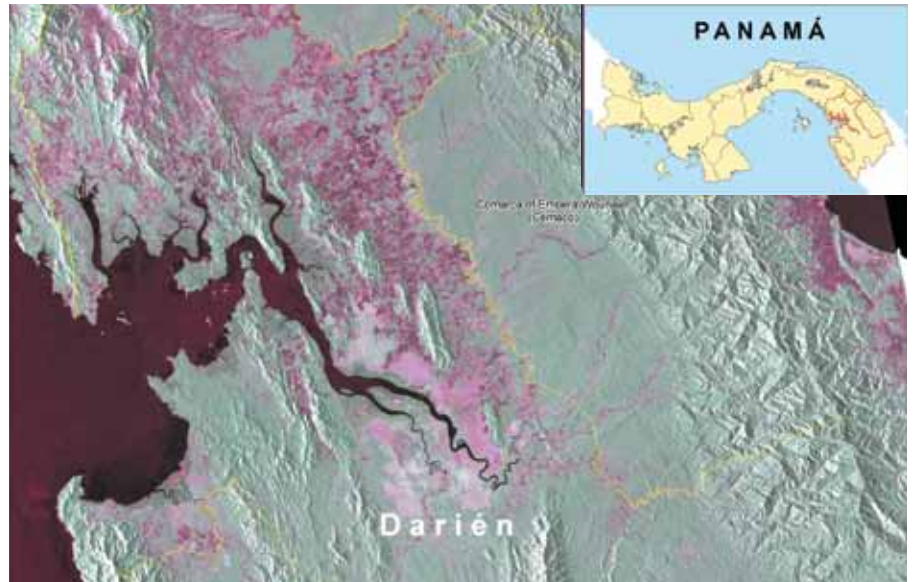
## Thinking Spatially with an Eye in the Sky

**U**SAID's climate change program is working to reduce greenhouse gas emissions that result from the way land resources are managed. Destructive logging, forest fires, agricultural expansion, and conversion to pastureland contribute significant amounts of greenhouse gases to the atmosphere each year.

The international climate community promotes an effort known as REDD+ (Reducing Emissions from Deforestation and Forest Degradation), which offers financial incentives to developing countries to conserve and enhance the stocks of carbon in their forested lands. Determining the amount of carbon in a forested landscape and monitoring the change in carbon stocks over time requires geographic information. Making maps of the landscape is also essential to addressing many other natural resource management and development challenges.

SERVIR, which means "to serve" in Spanish, is a program that uses geographic and satellite information to monitor and manage natural resources more effectively. It provides developing country governments with the capacity to monitor and forecast the weather, forest fires, air quality, and ecological changes, as well as respond to severe events such as red tides, landslides, and flooding.

Essentially, the SERVIR program helps managers make better decisions. In addition to generating forecasts, it can be used for visualizing environmental changes, which enables scientists, educators, project managers, and policy implementers to better respond to a range of issues including disaster



management, agricultural development, biodiversity conservation, and climate change. Analysis of this image, showing forest cover, will provide crucial input into carbon stock estimates in the Choco-Darién region of Panama, in one of Mesoamerica's largest remaining intact forests. It will be compared to previous forest cover maps of Panama to calculate the amount of forests being lost to agriculture and development.

For larger image, go to [www.usaid.gov/frontlines](http://www.usaid.gov/frontlines).

management, agricultural development, biodiversity conservation, and climate change.

SERVIR, which is a partnership between USAID and NASA, boasts three regional centers in Panama, Kenya, and Nepal, serving the countries in Mesoamerica, Eastern Africa, and the Hindu-Kush Himalaya regions. Each center houses a team of local specialists with expertise in remote sensing, geographic information systems (GIS) mapping, and database management.

New tools are being developed to address sustainable landscapes and climate adaptation. For example, in Africa, the SERVIR program will use satellite imagery to generate time-series land cover maps for eight East African countries. This important first step will help to

establish a baseline for calculating how much carbon is stored in the land, and how emissions of carbon dioxide increase or decrease as land use management changes over time.

SERVIR-Himalaya will monitor snow and glacial melt to inform managers of downstream water supply in Asian countries. Basanta Shrestha, based in Nepal with SERVIR-Himalaya at the International Center for Integrated Mountain Development, summarized his enthusiasm for the USAID-NASA SERVIR partnership: "SERVIR-Himalaya will be a key milestone in providing innovative solutions that integrate earth observation with geospatial tools for informed action and decision support in the areas of environmental and natural resources management in the region." ■



# Mapping Out Disaster, Relief, and Recovery

By *Sven Lindholm and Chad Blevins*

**T**oday's mapmaker is a mix of social scientist, field worker, graphic artist, and techie.

Looking for a more creative way to tell the stories of relief, recovery, and development, USAID—and in particular, the parts of the Agency that work in political transition and disaster response environments—have turned to such mapmakers and developed Geographic Information Units (GIU), expert teams of geospatial data analysts. The new USAID Geospatial Center is building on this foundation to increase spatial mapping capacity Agency-wide. The Agency uses cutting-edge technology to not only provide locations where USAID and other development organizations are working, but to better analyze its work.

Depending on the richness of available data, maps can feature various types of information, such as areas of conflict, ethnic/linguistic boundaries, economic statistics, and population density. The result is a graphic representation on paper—or on a screen—that can better inform disaster, relief, and transition programming.

For example, in March, the Agency worked with USAID's mission in Haiti to map out work areas for rubble removal, clearly displaying areas where implementing partners were working throughout Port-au-Prince.

The process demonstrated that the Agency had been and continues to work in some of the hardest hit areas of the capital on post-earthquake cleanup. The map was subsequently shared with the

United Nations, which received funding from USAID to start its own rubble removal activities as a way to avoid overlap.

A second map showed the density of damaged and destroyed buildings in Port-au-Prince. The density map—created with data from the USAID-funded

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**Visit [www.usaid.gov/frontlines](http://www.usaid.gov/frontlines) for more on how USAID is “thinking spatially.”**

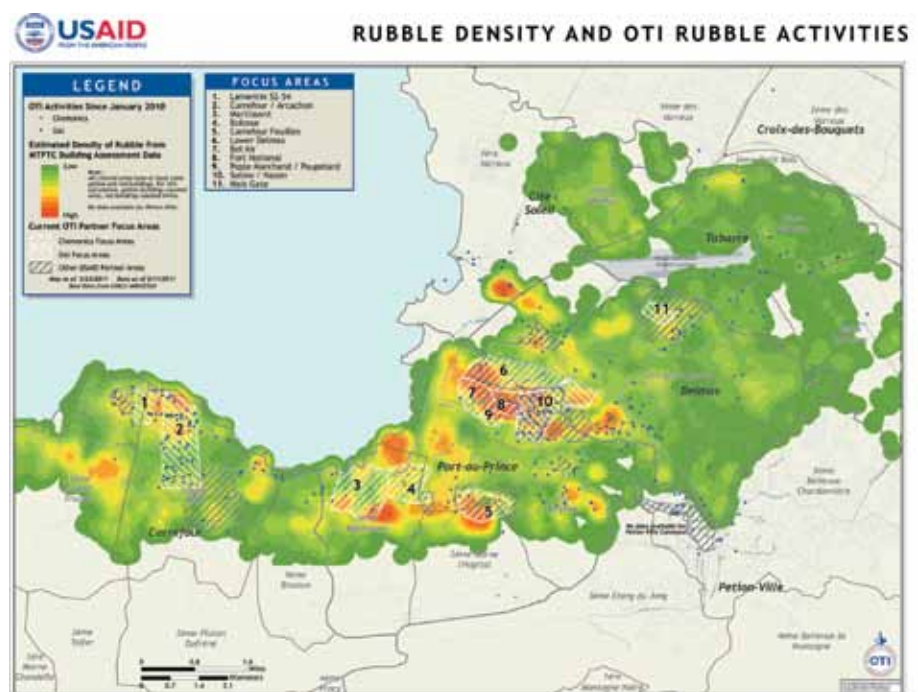
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engineering firm Miyamoto, the U.N. Office for Project Services, and the Government of Haiti's Public Works Ministry—was overlaid with the rubble map to show how USAID partners concentrated their efforts in areas with the most damaged buildings.

Together, the two maps led to a new awareness of the situation, creating a way to tackle and monitor the tons of rubble swamping the decimated capital city.

During the cholera outbreak in Haiti, USAID teams involved in the disaster response created maps that used daily caseload data to show the movement of the illness across the country, as well as the location of cholera treatment centers and oral rehydration points. These maps helped the DART, short for Disaster Assistance Response Team, based in Port-au-Prince rapidly mobilize assistance to target rural populations where caseloads were increasing.

In the aftermath of the recent earthquake and tsunami in Japan, USAID used geographic information system (GIS) technology to create maps that



For larger image, go to [www.usaid.gov/frontlines](http://www.usaid.gov/frontlines).

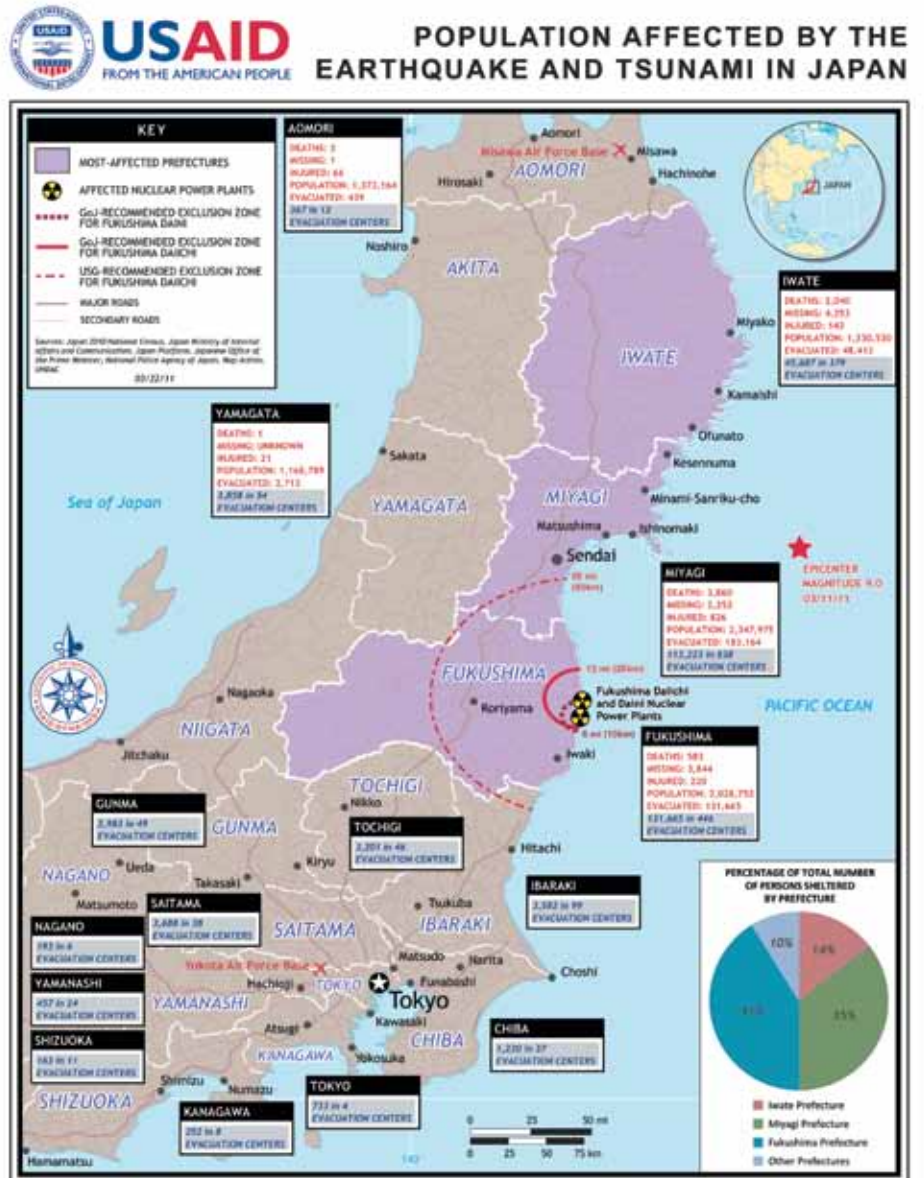


## THINKING SPATIALLY ABOUT DEVELOPMENT

provided a visual representation of the effects of the tsunami. Knowing which prefectures were most affected by the tsunami, where the damaged nuclear power plants were located, and the affected population figures helped the DART—including 148 urban search and rescue personnel—better respond to the needs in the field.

For the Agency's Office of U.S. Foreign Disaster Assistance, spatial thinking usually means creating maps that emphasize certain features of specific areas affected by catastrophe. These can range from general reference maps showing physical and man-made features or can highlight event-specific information such as earthquake intensity, cyclone paths, flood or fire extents, or the spread of an illness as was the case in Haiti. Technological advances are pushing the Agency to depict the effects of a disaster in near real-time, and satellites, smartphone, and open-source mapping allow for near real-time collection and dissemination of information in the middle of a disaster zone. They also make possible invaluable depictions of evacuation routes, key for effective early warning systems and disaster risk reduction, an important program focus.

Mapping isn't just for high-profile emergencies, though. USAID continues to pursue new ways to leverage technology and apply spatial thinking to its work. For example, in Uganda in April 2011, a GIU staff member assisted the USAID mission with mapping and geographic analysis of a USAID program that was closing down after three years. The geospatial data analysts created maps showing the locations and types of activities, and presenting a holistic view



For larger image, go to [www.usaid.gov/frontlines](http://www.usaid.gov/frontlines).

of the program, in particular the infrastructure investments. The staff also mapped the results of an Agency-funded perceptions survey. Maps showed the effects of other USAID Office of Transition Initiatives activities in transition countries, like one visualizing a radio station's increased broadcast area.

Part of the effort involved training the new geospatial staff at the USAID

mission on best practices and new software, and providing them with geographic activity data to improve their understanding of current USAID programs that could benefit future infrastructure planning.

In the end, the maps are another visual tool to help USAID tell its story and carry out its mission. ■

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