

The many challenges facing the planet—from poverty to natural disasters to water issues—are intensely linked, as are their solutions. The Earth Institute's interdisciplinary approach to sustainable development and its extraordinary contributions in research, education and the creation of real-world solutions are helping pave the way toward a better future.



ANNUAL DONOR REPORT 2011

*“As someone who has worked with Jeff side by side on many important global issues facing us and this planet, I can think of no better leader for the Earth Institute as we face the next five years and the race to meet the Millennium Development Goals. At the Earth Institute, Jeff can continue his tireless and courageous leadership and will use this platform to continue to remind us of the economic, political and moral choices that we can and should make for the betterment of mankind and the planet.”*

—Ted Turner





Students enjoying lunch at a school supported by the Millennium Villages Project.

Left: Oceanographer William Ryan and Research Staff Assistant Kevin McLain mapping the sea floor at the Lamont-Doherty Earth Observatory.

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## FROM THE PRESIDENT OF COLUMBIA UNIVERSITY

*“By developing models of change that work in real life, MVP clusters have seen farm yields triple; subsistence transform into profits; a new and robust health infrastructure grow; and school meals for all children as they reach for new horizons through education.”*

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Ellen Barmoz

**COLUMBIA UNIVERSITY HAS ALWAYS BEEN COMMITTED** to applying its resources and knowledge to the most urgent issues facing our community and our world. The scope of this concern has grown over our long history to encompass the entire globe. Today we are striving to better understand and respond to a lengthy list of challenges ranging from climate change and sustainability to poverty and global public health. The recent series of natural and man-made disasters—including food shortages, severe drought across different continents, the Gulf oil spill here in the United States, and Japan’s earthquake and resulting tsunami and nuclear crisis—only serves to underscore the importance of this work.

Within our academic community, and indeed around the world, Columbia’s Earth Institute is a recognized leader of the effort to address these problems. The Earth Institute functions as an interdisciplinary hub, employing a unique structure to harness the intellectual resources of engineers, economists, legal scholars, social and political scientists, and more than 200 research scientists at the Lamont-Doherty Earth Observatory who are adding to our knowledge about the origin, evolution and future of the natural world.

These cross-disciplinary collaborations advance understanding of the earth’s systems while supporting applications of new knowledge that will benefit humankind directly. The Institute’s work ranges from building the infrastructure for managing water resources in rural communities from Brazil to Australia; to developing sustainable responses to persistent health risks and poverty in Haiti and other struggling nations; to educating a new generation of leaders in Columbia University’s program leading to a Master of Science degree in Sustainability Management.

The future prospects for maintaining this record of service and scholarship are enhanced by the fact that Jeff Sachs will continue to serve as director of the Earth Institute for another five-year term. Jeff’s dynamic vision of sustainable economic development has helped engage other scholars from a wide range of disciplines and also created new partnerships beyond the university that benefit people and communities around the world.

On the pages of this report, you will find a sample of the remarkable projects conducted by the Earth Institute and the people who lead them. Columbia is indebted to our donors for making this work possible, and we thank you for supporting our commitment to bring the best academic research together with a truly global mission of public service.

Sincerely,

A handwritten signature in black ink that reads "Lee C. Bollinger". The signature is written in a cursive, flowing style.

Lee C. Bollinger

## FROM THE DIRECTOR OF THE EARTH INSTITUTE

**THIS HAS BEEN QUITE A YEAR IN THE SAGA OF SUSTAINABLE DEVELOPMENT.** Each passing month has taught us again of our vulnerability and our need to learn to live sustainably with nature. The evidence is everywhere that humanity's impact on the natural environment is taking us into complex and unexplored dangers. Thank goodness, I tell myself, that Columbia University more than a decade ago had the foresight to launch a University-wide initiative on sustainable development, drawing in hundreds of scientific and development experts in a common cause. How honored and privileged I am to lead the Earth Institute; I am endlessly thankful to Lee Bollinger for graciously reappointing me director through the end of 2015.


The Earth Institute is at the forefront in measuring and monitoring climate change, the collisions of population increase and loss of biodiversity, the burdens of infectious disease and undernutrition in impoverished rural communities, the legal redress for environmental damages, and the ways to combine economic development of mining sites with sustainable development of the host communities and countries. We are at the forefront in supporting Haiti in its recovery from the devastating earthquake and other disasters, and in aiding a nation to make a breakthrough to sustainable development. Our impact stretches to Africa, India, Asia, Latin America, and beyond to address the shared problems of hunger, disease, poverty, natural hazards and biological conservation. There are few places in the world where the Earth Institute is not present; even Antarctica, the ocean floor, and the highest glaciers of the Himalayas feel our influence.

I have the high privilege to visit dozens of countries each year, meeting with a variety of people from world leaders to local villagers, seeing for myself the unprecedented potential for human progress as well as the blight of human loss and waste. I also see a new generation of young people around the world ready to grasp the challenges of sustainable development. I believe that, first and foremost, the Earth Institute serves those young people. If we accomplish any single goal, it should be to empower the coming generation of global citizens with the scientific knowledge, the global perspective, the ethical underpinnings and the practical experience necessary to address and solve the harrowing challenges of sustainable development that they will confront in the next several decades. While the task is immense, I am certain that through our innovative education programs, ranging from the new major in sustainable development at the College to the unprecedented Ph.D. in Sustainable Development, the Earth Institute is making a difference.

We at the Earth Institute are asked fervently to help ever more countries, examine more problems, make faster research progress, educate more leaders, advise more heads of state and prepare more plans of action. Of course we must watch our way to ensure that we abide by the highest standards of rigor, ethics and responsibility in responding to these huge questions. Yet at the same time, I know that it is right to respond to these urgent and growing requests. They reflect a deeper hunger for problem solving and networking at a global scale.

This report highlights the remarkable energy, talent and scope of activities among my wonderful colleagues, demonstrating the profound impact of your unyielding partnership and steadfast support. The 21st century is the age of sustainable development. We must work together to master these challenges before they master us. Please join the Earth Institute in this life-affirming and global cause. I know that I can count on your continued leadership, generosity and support.

With best wishes,



Jeffrey D. Sachs



Woods Maritzall

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*“In this past year,  
the Earth Institute’s  
scientists, researchers,  
faculty and  
students conducted  
crucial research  
to find solutions to  
the world’s most  
pressing challenges.”*

**In an environment devastated**

by extreme  
poverty  
and hunger

**we have**

increase  
from **1 ton**  
**to 3 tons**  
**per hectare.**

The scaling up of sustainability efforts in the Millennium Villages has greatly benefited local populations in sub-Saharan Africa.



# seen harvest results

# SCALING UP RESULTS TO DEFEAT WORLD HUNGER

Below: Abundant crop yields in the Millennium Villages (maize harvest, Mbola, Tanzania).



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**Five years ago, Pedro Sanchez, director of the Earth Institute's Tropical Agriculture and Rural Environment Program and Millennium Villages Project (MVP), stood in the village of Sauri, Kenya—the first Millennium Village—and had a “wow” moment.** In an environment devastated by extreme poverty and hunger, Sanchez had just seen some spectacular harvest results, triple the usual. “As an agronomist, I expected this,” says Sanchez of the Earth Institute’s research-based innovations, “but as a human being, it was highly emotional.”

Today, the MVP has made bold progress. By developing models of change that work in real life, MVP clusters have seen farm yields triple, subsistence transform into profits, a new and robust health infrastructure grow and all children be provided school meals as they reach for new horizons through education. The Earth Institute and partners are now pressing forward to the next level of Africa’s Green Revolution, not only continuing research at the MVP clusters, but also scaling up from those

successes to share best practices throughout the continent and beyond. We call it African Green Revolution 2.0.

A soon-to-be-established Center for Global Agriculture and Food Systems—supported with generous funding from the Rockefeller Foundation, Monsanto, and other partners—will lead a larger, more unified push to achieve the Millennium Development Goals. With private and public sector partners, the Center will improve research into poverty mitigation by creating global metrics; strengthen Africa-based scientists as Columbia University research faculty; help create a global digital soil map to enhance local agriculture, improve use of water resources and adapt to climate change; and advocate effective, science-based policies for sustainable agriculture worldwide.

Ending extreme poverty and hunger through environmentally sustainable change means finding ways to feed more people and creating new economies, new connections and new attitudes. “I saw this beautiful girl standing with her parents in





Millennium Promise



Millennium Promise



Dr. Pedro Sanchez with local farmers in the Nyanza Province of Kenya.

Koraro, Ethiopia,” says Cheryl Palm, science director of the MVP, who was interviewing families at the site. The girl was just the “right” age for marriage, maybe 12 or 13. Was her father eager to marry her off, Palm wondered, or might the girl be planning to continue school? When Palm asked her, the girl said, “I am going to go to secondary school. I want to be a nurse or a doctor.”

“Is that all right with you?” Palm asked the father, who had final say. The dowry he stood to make was probably several cows, and certainly the boys were already asking for her hand.

“Yes,” he said. “We’ve discussed it as a family and it’s very important for girls to go to school.” The father’s attitude points to the root of the social change that begins to happen when farm families are food-secure in villages that are becoming malaria-free zones. Sustainable poverty abatement, educational opportunity, girl empowerment and reliable healthcare naturally evolve into greater optimism for the future and a real chance to break from the cycle of poverty, hunger and disease.



“The Earth Institute has played an important global role in pioneering science to advance solutions to some of the world’s most pressing problems—health, poverty, agriculture, energy and education. The Gates Foundation and the Earth Institute share a common agenda: We focus on those areas and people who are often most neglected by society, science and technology. We also share a belief that if we stimulate good science and good practice, we can work to implement solutions to the critical problems facing our planet today.

Our partnership has been a valued component of the Foundation’s work in both Africa and India, with pioneering programs and strategies that work across many scientific, policy and programmatic boundaries. My visit to Columbia last year and the chance to interact with the amazing range of scientific talent in each of these fields confirmed my belief in our joint work. We look forward to continuing this partnership with Columbia and with the Earth Institute over the coming years.”

—Bill Gates

# DESIGNING A SUSTAINABLE ENERGY FUTURE



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Corey Russell

**At the Lenfest Center for Sustainable Energy (LCSE), scientists are working to allow continued economic development in the face of climate change by halting—not just reducing—net emissions of globe-warming carbon dioxide.** “Think of pouring water into a cup: as long as you pour water into the cup, the water level goes up,” says Klaus S. Lackner, director of the center and Ewing-Worzel Professor of Geophysics. “It does not matter whether the maximum allowable level is one inch below the rim or one and a half inches below the rim. In either case, you will eventually have to stop pouring.” To meet this challenge, Lenfest researchers are studying energy technologies that close the carbon loop altogether.

Lackner, for instance, is working to produce synthetic hydrocarbon fuels by converting carbon dioxide captured directly from the air.

Capturing the CO<sub>2</sub> uses a process called “moisture swing absorption” that is studied at LCSE. In the laboratory, he is

using a device that looks like a small pine branch, which contains a resin that absorbs CO<sub>2</sub> when dry and releases it again when exposed to moisture. This makes possible a closed-loop system where the captured emissions can be recycled into fuel with the help of renewable energy. Because such fuels can be produced using nonbiological processes, they do not share the disadvantages of biofuels in terms of land and resource use, competition with food supplies or other related impacts. These fuels would be entirely carbon neutral.

Lackner has also begun exploring ways to use modern automation technology to build much smaller fuel-synthesis plants and wind turbines, both key components in a closed-loop carbon system. Such systems are currently characterized by massive installations and large capital investments; Lackner believes that if they could be shrunk, they might become more economically feasible.

Left: Alex Luntz, a Columbia College junior, and Senior Staff Associate Allen Wright assist Professor Klaus Lackner in setting up a demonstration of air capture technology in the Lenfest Center for Sustainable Energy's air capture laboratory. The white fiber "tree" is contained in the closed environment of the glove box allowing researchers to show its ability to absorb carbon dioxide from the air.

Allissa Park, the center's associate director and junior professor in applied climate science, is also pursuing research in energy conversion systems and carbon capture. The National Science Foundation has honored her work with its Career Award. With funding from the U.S. Department of Energy, Park has studied a carbon capture and storage technology that draws upon enhanced weathering, the breaking down process of silicate minerals to store carbon permanently.

"We live in a society that is built on and uses large quantities of fossil fuels," says Park. "Anything made from carbon can be converted into valuable fuels or chemicals. We are improving the design of the energy conversion system from the beginning in such a way that we won't have to clean up our mess at the opposite end."

*"We are improving the design of the energy conversion system from the beginning in such a way that we won't have to clean up our mess at the opposite end."  
—Allissa Park*



Corey Russell 2011

The Lenfest Center for Sustainable Energy is also focused on the development of a novel CO<sub>2</sub> monitoring technology that utilizes a carbon-14 tag. Midway through a U.S. Department of Energy funding award, this innovative carbon-14 tag system has shown great potential as a powerful monitoring and inventory tool that may one day be able to provide the public with the assurance to accept geologic carbon dioxide storage.



Corey Russell 2011

Above: Ph.D. candidate Greeshma Gadikota prepares an experiment for Professor Allissa Park's carbon mineralization project. Funded by ARPA-E and NSF, this research explores enhancing mineralization of carbon dioxide using chemical and biological catalysts.

Left: Lenfest Professor Allissa Park discusses the conversion of nonrecyclables into liquid fuels with graduate students Kyle Fricker and David Dogon. Recognized with the National Science Foundation's Career Award, this research explores the conversion of municipal waste into high-value products and the storage of resulting carbon dioxide via in-situ, or on-site, carbon sequestration.

# DESIGNING LOCAL SOLUTIONS FOR THE GLOBAL WATER CRISIS



**For those who have never experienced a lack of freshwater, the devastation to life and hope is hard to imagine. Take for example Maria Joselivia de Oliveira Freitas and her grandson Hugo in Pedra Fina, Ceará, Brazil. To get water for their house, Hugo had to trek to a lake kilometers away eight to 10 times each day.** Hugo could not get to school until he had made many trips. He was never on time. And after school, Hugo made more water trips; studying or playing with friends was often impossible. It was exhausting.

For people like Maria and Hugo, no clean water means ill health, failed education and no prospects. When a PepsiCo Foundation grant funded the Columbia Water Center's research and a demonstration project that brought fresh, clean water directly into Maria's home, Hugo celebrated with fireworks.

Around the world and in the United States, the Water Center is finding ways to achieve water sustainability. "People think it's a local issue, but [water scarcity] is a systemic problem in many places in the world," says Upmanu Lall, director of the Water Center. "Solutions may be local but the nature of the problem can be addressed globally." In fact global climate predictions—long-term forecasts of drought and flood—enable governments to make "intelligent decisions," says Lall. Training local scientists to predict climate trends is critical.

The Water Center's many programs not only scientifically research "best practices" but also endeavor to create sustainable solutions. In Brazil, for example, based on its research, the Water Center developed a Municipal Water Plan, a manual that shows each community how to understand its own needs and create local infrastructure for fresh running water. In Maria and Hugo's municipality, the mayor was so encouraged by the demonstration project that he committed the rest of his term to bringing running

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*"People think it's a local issue, but [water scarcity] is a systemic problem in many places in the world."*  
—Dr. Upmanu Lall

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water to all homes. Equally inspired, the state’s secretary of agriculture plans to create municipal water management plans for all of Ceará’s approximately 180 municipalities.

In other places, such as India, the groundwater table is dropping so low that irreversible contamination looms. “Once seawater breaks through into the aquifer, it can’t be fixed,” says Daniel Stellar, former assistant director of the Water Center. “Already farmers are pumping irrigation water from extraordinary depths ... mining groundwater. Rain can’t replenish it.”

The solution lies in promoting a sustainable balance. Currently, the government helps farmers with free electricity to pump and irrigate. The Water Center’s plan transforms that subsidy into cash. Farmers can either spend all their money on pumping water or they can conserve water with simple techniques and keep the cash.

Currently implemented in Northern Gujarat, India, the new program is expected to produce a water savings of 20 to 30 percent. Once demonstrated, it will be a way to preserve the aquifer and help farmers throughout the subcontinent. “The broad concept,” says Vijay Modi, director of the Millennium Villages Infrastructure Programs, “is applicable to everything. It’s not just about water.” The idea, Modi says, is to help farmers make better decisions.

Far left: Water samples being taken at the reservoir that supplies the Ingá community in the Ceará state of the Northeast Region of Brazil.

Above: Farmers in the Kukarwada district of Gujarat face significant water challenges that the CWC is addressing through a novel policy reform.

Above: During the rice season in Punjab, groundwater is pumped whenever power is available, delivering a huge quantity of water to the fields.

Columbia Water Center researchers conducting GIS surveys of land in the Kukarwada district of Gujarat. This detailed mapping is the first of its kind and will be integral to understanding the success of the pilot project.

“With the PAM (Municipal Water Plan), the Earth Institute has put solution power into the hands of poor rural households choked by insufficient and inconvenient water supply. The Earth Institute’s model ensures local ownership and sustainable management of water resources, which is increasingly critical during this time of climate instability. The PAM is relevant, [as] demonstrated by the speed with which the model has been adopted by the State government and [for which it] allocated funding for replication across 24 municipalities. This is effective innovation in real time. PepsiCo Foundation invested precisely to make these sorts of improvements possible. The Earth Institute has created a valuable tool that can be applied in water-stressed dry lands around the globe.”

—Claire Lyons, Manager,  
Global Grant Portfolios  
PepsiCo Foundation

# BREATHING NEW LIFE INTO NEW YORK CITY SCHOOLS



CERC

**Engage a middle school student in how conserving energy directly links to conserving our environment and you just might revolutionize a child's life.**

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Nancy Degnan, executive director of the Center for Environmental Research and Conservation (CERC), lights up when talking about the power of hands-on science. “We focus especially on middle schools,” Degnan says about CERC’s K–12 New York City education programming. “Attendance in middle school is highly correlated to performance in high school. Recent reports show the United States is lagging behind in science and math as we continue to see low rates of high school graduation. Getting and keeping students excited about science means that they are more likely to come to school and perform better in all subject areas.” The benefit is that today’s middle school students will be tomorrow’s

environmental leaders. “Sustainability means supporting youth to obtain and promote lives of socioeconomic and environmental well-being and fulfillment. That’s what we are ultimately all about.”

CERC is an active force in revitalizing New York City’s core curriculum. “We are deeply committed to doing our part in President Obama’s “Race to the Top” initiative focusing on science, technology, engineering and math (STEM) through the lens of ecology,” says Degnan. “We do this through strong partnerships with our fellow educators at the secondary level, as well as organizations in the private and nonprofit sectors.”

The School of Environmental and Applied Sciences (SEAS) at IS 52 in New York City is one such partner. Serving a population of predominantly Latino students, it is one of five middle schools participating in the Inter-School Environment and Energy Research Project funded through an initiative of the National Science Foundation called TREES (Technology,



Above: Students receive a medal from CERC due to their hard work on learning more about ecology and how to protect our planet.



*“Sustainability means supporting youth to obtain and promote lives of socioeconomic and environmental well-being and fulfillment. That’s what we are ultimately all about.”*

Research, Ecology Exchange for Students). TREES focuses on STEM learning and 21st-century skills and careers, and includes partners in the nonprofit and business sectors that also practice the STEM model.

Starting with a hypothesis, teams of students used special equipment to monitor the flow of energy to appliances and devices throughout their schools like smart boards, vending machines, and computers. Students then analyzed their results, made recommendations, and gave real-world “briefings” as interschool energy consultants.

Pam Scott, a literacy teacher at IS 52, commented, “When Nancy first told us about the term *vampire energy* and the Modlet, a brand-new product designed by engineers at ThinkEco and Junior Energy, we all got very enthused. They want to combat the problem of the energy wasted when appliances are in standby mode. We knew it was a perfect fit for our students. They learned a tremendous amount and can’t wait for Phase II next year when we branch out into our community. We’re also going to be looking for concrete evidence of increases in student performance. This is truly cutting-edge.”



Above right: Nancy Degnan, CERC’s Executive Director, discusses environmental sustainability issues with middle school students.

Bottom left and above right: Students from IS 52 Inwood discuss their final presentation for the Interschool Energy Project held at the new Science and Engineering Building at Columbia University on April 2, 2011.

# THE SOUTH OF HAITI: POISED ON THE BRINK OF CHANGE



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**It's an exciting time when scientific research directly supports efforts to transform a landscape with local food systems that are able to maintain an entire community, health systems that can provide services for the local population and energy systems that supply an infrastructure for sustainable growth. In the South of Haiti, that transformation is poised to happen now.**

A new Millennium Villages Project (MVP) is being launched in Haiti's Port-à-Piment watershed area, one of the poorest regions in the Western hemisphere. The Port-à-Piment project is uniquely poised for scale-up and will evolve within the broader regional Côte Sud Initiative, which covers 10 communes throughout Southwestern Haiti. The Earth Institute, in partnership with the United Nations Environment Programme, the Government of Haiti and organizations such as Catholic Relief Services and the Organisation pour la Réhabilitation de l'Environnement, has helped form a collaborative platform to implement MVP successes at a regional scale from the start.

"The ability to expand regionally right from the beginning is critical," says Alex Fischer, the Haiti project manager at the Center for International Earth Sciences Information Network (CIESIN). Fischer, who was in Port-au-Prince when the 2010 earthquake struck, has been conducting research in the country for the past two years. "We have been researching the links between ecosystem restoration projects in Haiti and efforts to improve livelihoods and reduce the risk of natural disasters."

To address root causes, says Fischer, "we need an integrated solutions approach. The Millennium Villages Project is the best way to do that."

The MVPs are by their very nature interdisciplinary, integrating strategies to alleviate malnutrition, poor potable water access, disease, poverty, gender inequalities, lack of education and inadequate shelter simultaneously, as each problem perpetuates the others, creating negative cycles of poverty.





Animals continue to serve as one of the primary forms of saving for rural Haitian families, yet they can be destructive to hillsides and vegetation.



Trial and demonstration plots help researchers measure different yield rates based on seed variety and fertilizer application.

*“We need an integrated solutions approach. The Millennium Villages Project is the best way to do that.”*

Currently pressures inside Haiti are higher than ever because of last year’s earthquake. “There was a rural migration to cities before the earthquake. Afterward, people went back to the countryside,” Fischer says. In places such as Port-à-Piment, the population nearly doubled due to a massive influx of displaced persons. “The pressure on natural resources became even more visible.”

Some specific initiatives for the new MVP, which will support over 30,000 residents, are increasing crop yields through training and improved inputs, improving energy systems with solar power and easy cell phone-based payment systems, reducing vulnerability to weather-related events through early warning systems, supporting a viable healthcare system and monitoring results by using proven cell phone-based technology.

The success of the Haiti MVP and regional initiative is linked to relationships built at the local, regional and national levels. Establishing and strengthening these relationships has been an important component of the Earth Institute’s work in Haiti for the past two years through the efforts of Tatiana Wah, Haiti policy director and national Millennium Development Goals adviser. Wah serves as the Prime Minister’s adviser and also as the strategy and planning director of the Interim Haitian Reconstruction Commission. “The link to national policy makers is providing the critical forum to share and integrate lessons learned at a local and regional level,” says Wah.

“The Government of Haiti has embraced the model of an integrated and science-based approach to development,” Wah says. “Designed to scale up, the Port-à-Piment MVP and broader Côte Sud Initiative represent a real opportunity to reimagine Haiti.”



Far left: The use of terraces, erosion barriers and perennial crops are some hillside management techniques being used to reduce runoff and erosion in the village.

Left: 3D Visualization of the Port-à-Piment watershed. Source: CIESIN, 2010.

# A GROWING COHORT OF SUSTAINABILITY MANAGEMENT PROFESSIONALS



Left: The sun setting over the New York City skyline during a blackout.

Right, top: Dr. Steve Cohen addresses his M.S. in Sustainability class.

Bottom, right: M.S. in Sustainability graduates Chak Cherdstirkul and Shinsuke Nuriya.

**Only decades ago, environmental concerns were peripheral to business, a few bumps in the road toward the central concern of making product and profit. That landscape has changed.** “Going forward,” says Steven Cohen, executive director of the Earth Institute, “every effective manager has to be a sustainability manager.”

With its new jointly-offered Master of Science in Sustainability Management, the Earth Institute and Columbia University’s School of Continuing Education are on their way to becoming leaders of this trend. “We’re getting students from all over the world,” says Cohen. “There’s nothing [else] quite like it.”

Chak Cherdstirkul, one of the program’s first graduates, wasn’t thinking much beyond learning Chinese and getting a job when he graduated from college with a degree in economics. Once he started working as a consultant in Thailand, however, sustainability came to the forefront. “I was helping a company do a study on how to use municipal solid waste to replace coal,” says Chak. “Energy has such an impact. It’s there in every person’s life.” As Chak worked in a variety of jobs, his enthusiasm for small renewable energy projects grew.

“I wanted to develop a solar farm,” Chak says, “but I realized I didn’t have enough knowledge. I don’t have an engineering background.” To pursue his goal, Chak decided to enroll in Columbia’s master’s program in sustainability management.

The master’s program appeals especially to professionals like Chak. Part time or full time, the program integrates five subject areas: public policy, economics, the physical dimensions of sustainability management, general and financial management, and integrative sustainability courses. Students from across different business sectors join a unique, interdisciplinary community, enabling them to apply sustainability management to any organization.

The diverse resources of New York City contribute to the program’s richness, as well. Professionals working in the field often teach, and students culminate their studies with a New York City “capstone” project. Working with a local nonprofit, students create a real-world sustainable solution to a real-life problem in their local community.

“The program is so flexible,” says Chak. “I’ve studied energy business and finance, sustainability architecture and



Alan Oling

photovoltaics.” Furthermore Chak has had the opportunity to access the many experts on campus. “I’ve talked to professors in the School of Engineering,” Chak says. “Whatever I am interested in.” A guest speaker was particularly inspiring because he, like Chak, had no engineering background and yet he founded a wind farm in Massachusetts.

Today Chak is pursuing his dream to make a significant contribution to the world by working in renewable energy. His next steps toward developing a solar farm will be to work with private equity and development firms in Southeast Asia. It’s an exciting time for the Earth Institute, as well. With its first graduates launched into business, the Earth Institute looks forward to swelling the ranks of business professionals who will lead the global sustainability movement.



John Quilly

## Preparing the next generation of environmental and sustainable development leaders

The Earth Institute is dedicated to training a new generation of scientists and policy makers and currently has more than 800 students enrolled in its academic programs. It was the first institution in the United States to offer a doctoral program in Sustainable Development and includes an Interdisciplinary Ph.D. in Sustainable Development and a Ph.D. program in Earth and Environmental Sciences.

Our specialized master’s degree programs serve as models for universities around the world that are working to incorporate sustainable development studies into their curricula. At present, we offer master’s programs in Climate and Society, Conservation, Earth and Environmental Science Journalism, Earth Resources Engineering, Sustainability Management, Environmental Health Sciences, Environmental Science and Policy, Energy and Environment, Environment Graduate Global Classroom, and Public Administration in Development Practice.

The Earth Institute’s new undergraduate major in Sustainable Development is one of the first degree programs of its kind in the United States. Moreover it provides students with the option of applying to the Global Fellows Program, which enables participants to study abroad, join research projects, or work outside the Columbia campus.

For more information about the Earth Institute’s educational programs, please visit [www.earth.columbia.edu/education](http://www.earth.columbia.edu/education).

# ASSESSING THE MAGNITUDE OF A DISASTER



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**When the Deepwater Horizon explosion left crude oil gushing from a wellhead 1,544 meters under the waters of the Gulf of Mexico, no one knew for sure how fast the oil was escaping. Although the government raised its initial estimate of 1,000 barrels per day to 5,000, scientists examining aerial photos suggested that this estimate was still too low.** “Others,” says Timothy Crone, a marine geophysicist at the Lamont-Doherty Earth Observatory, “suggested the flow could not be measured at all.”

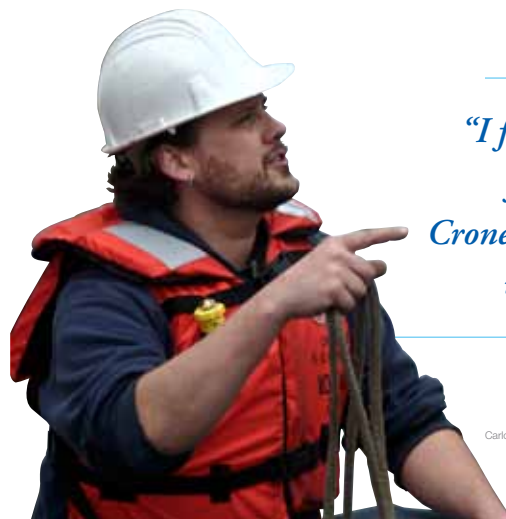
Crone knew otherwise. “As soon as I saw the video,” Crone says, referring to the first underwater clip of the broken wellhead, “I knew it could be measured.”

Back in 2006, while researching hydrothermal vents deep underwater, Crone developed a special measurement technique called “optical plume velocimetry.” By analyzing video of the underwater flow from the vents, Crone was able to calculate the rate of flow accurately. When Crone saw BP’s

video of the underwater gusher, he knew his technique, designed to observe a natural phenomenon, could also measure the rate at which oil was pouring from a man-made structure into the Gulf.

“I felt it was important for me to help,” says Crone. Fortunately he was funded to do so. Researchers are often limited by their specifically targeted federal grants. But because Lamont-Doherty’s endowment covers a portion of Crone’s salary, he could devote some time to new or unexpected projects and was able to start immediately.

Using that initial video clip, Crone was able to provide a rough estimate of the crude oil flow rate within a day. As he had suspected, the rate was more than the 5,000 barrel-a-day estimate, a good deal more. The next day, Crone’s findings were reported on National Public Radio, making him one of the first to publicly challenge official oil-flow estimates.

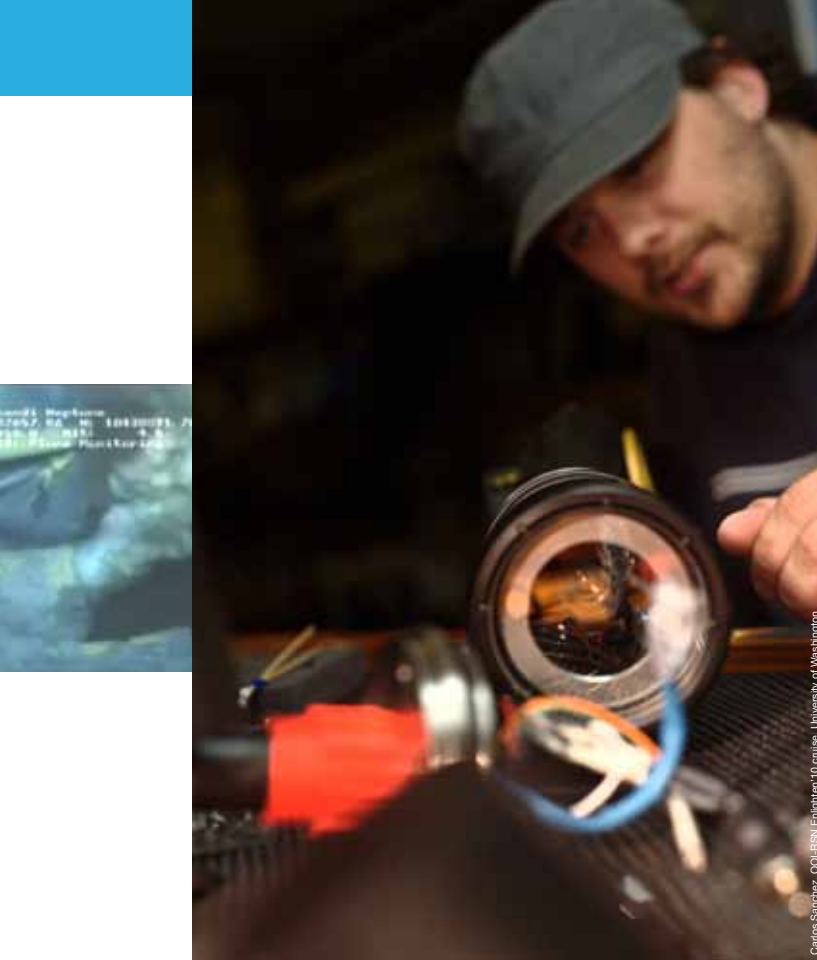


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*“I felt it was important for me to help,” says Crone. Fortunately Crone was funded to do so.*

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Above, left: Clean-up crews comb the oil-covered beaches of the Gulf of Mexico.



Carlos Sanchez, OOI-RSN Enlighten-10 cruise, University of Washington



Left: Tim Crone at work on his VentCam, a sophisticated video camera he designed that captures images of water seeping out of hydrothermal vents.

All Crone needed for greater accuracy was better quality video, and he got it from several lawmakers involved in the congressional hearings relating to the spill. With the help of his colleague, Lamont-Doherty marine geophysicist Maya Tolstoy, Crone determined that oil was flowing into the gulf at about 10 times the official estimate: 56,000 barrels a day. Their findings later appeared in the journal *Science*—the first peer-reviewed published estimate—and agreed closely with the eventual official figures.

More than a year after the Deepwater Horizon explosion, the fate of the Gulf's ecosystem is still unclear. "We don't really understand how the oil has degraded," says Ajit Subramaniam, a biological oceanographer at Lamont-Doherty, "or what chemical and biological changes have occurred." Without such understanding, it becomes harder for Subramaniam and his colleagues to predict the long-term effects of such disasters.

One thing is clear: Channeling financial resources into basic earth science allows today's scientific breakthroughs to serve as solutions for tomorrow's environmental challenges.

"A key lesson here," Crone says, "is that basic research in the earth sciences can often have unanticipated value and applications for society as a whole. This is a case where my research into an esoteric problem was all of a sudden applicable to a very immediate problem, something that was front and center in the minds of people all over the world."



Carlos Sanchez, OOI-RSN Enlighten-10 cruise, University of Washington

## A CLASSROOM IN THE FIELD



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Foundation, which will give undergraduate students studying sustainable development the opportunity to take their academic studies into the real world. Graduate students such as Marriott currently receive funding from donors like Ceil and Michael Pulitzer, which provides them with field experience that teaches them how to abandon preconceptions and create unique solutions in a way no book or professor can.

“You often have that moment when you realize the theory doesn’t apply, or applies in a different way than you thought,” says Kevin Griffin, associate professor and interim director of the Special Concentration in Sustainable Development. “Even if they become theoreticians,” Griffin adds, “they understand the real processes.”

Fieldwork in Zaria, Nigeria, gave SIPA graduate Jessica Garrels “a firsthand look at the challenges of qualitative research when it’s driven from the outside.” Garrels says, “internships make you more aware of possible best practices and potential pitfalls; they help you think outside the box.”

Without fail, students who have experienced working in real-life, on-the-ground environments report a profound shift in commitment.

**What struck him first was the sweltering heat, the crowds, and the AK-47s slung over the shoulders of the men “as if they were an accessory.”** In that moment, School of International and Public Affairs (SIPA) graduate Ryan Marriott knew he was going to learn more than just how to collect field data in Nigeria.

“No matter how mentally prepared you think you might be for the level of poverty and underdevelopment,” says Marriott, “nothing can substitute for really living it.”

Field education is a valuable part of a sustainable development curriculum, and the Earth Institute has long offered field internships that enhance and expand students’ learning. The Earth Institute will soon launch the Global Fellows Program, created with a generous gift from the Denning Family





Alan Orling



Elben Barrozo

“It gives you motivation,” says Tal Lee Anderman, a School of General Studies senior majoring in sustainable development, “figuring out what’s important to you—you need that face-to-face experience.” Anderman says statistics “become individuals you care about.”

“You hear how many people die of malaria, malnutrition,” says Mitsue Yamamoto, a SIPA student and Pulitzer intern who witnessed this firsthand in Gumulira, Malawi. “Peoples’ lives become numbers. You think: Why am I doing this? Then I saw the people in the village, people struggling with malaria, hunger.” Yamamoto talks about the trip’s impact on her emotions and how it clarified her life’s direction. “I still keep in touch with people there.”

Fieldwork does more than make a student into a professional. It builds character and adds resolve. This essential part of our sustainable development programming will build a cadre of committed leaders.

“It’s a chance to know what everyone is talking about and why the Institute’s work is so important,” says Ryan Marriott. “Sure, it’s great for the résumé, but it was really great for Ryan the person.”

In the fall of 2010 Columbia University launched its first new undergraduate degree in 50 years, a Bachelor of Arts in Sustainable Development, currently co-directed by Professors Ruth DeFries and Jason Smerdon. Responding to the need for a workforce that is both internationally and environmentally conscious, the Earth Institute collaborated with Columbia College, the School of General Studies and departments across Columbia University to create a degree program that would give students the holistic education and skill set necessary to become future leaders.

The Sustainable Development program consists of a major and special concentration and gives Columbia undergraduates the opportunity to explore the interplay between the natural and social systems that impact our world’s economic, political and environmental well-being.

Far left: Global Fellow Derek Nelson digs a well in the maize fields of the Sauri Millennium Village in Kenya.

Left: Student Tal Lee gets inspiration for her senior thesis on a trip to Peru.

Above, left: Students discuss their respective projects in Hogan Hall. They are (from left) Tal Lee Anderman (junior, General Studies), Erin Stahmer (junior, Columbia College), Ryan Marriott (senior, SIPA) and Jessica Garrels (senior, SIPA).

# REFINING CLIMATE PREDICTION IN AFRICA



David Gottlieb

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**Africa trails the developed world in the number of weather stations it operates but still produces a large amount of data.** Unfortunately, few scientists have access to that data, which could lead to more accurate short- and long-term climate forecasts, allowing farmers, relief workers and public health experts to plan for and manage climate-related events.

The reason: In order to offset the cost of running their weather services, most African countries must charge a fee for their data. In recent commentary published in the journal *Nature*, Madeleine Thomson, a malaria expert at the International Research Institute for Climate and Society (IRI), argues that an alternative funding mechanism would help Africans better fight disease. Then she and her colleagues demonstrated how to do it, with a paper using climate data collected in Kenya suggesting that recent increases in malaria there could have a climatic basis.

In Kenya some 1,500 weather stations gather detailed climate information, but data from only a few dozen of those stations are publicly available. Airlines are willing to pay for some extra information, but most researchers cannot. As a result, scientists must rely heavily on global satellite data, which produce

Above: With climate data from Kenya's Kericho Tea Estates, IRI's Judy Omumbo (right) confirms that the region has been warming.

Right: Kenyan tea farmer.

less accurate climate models. For the last decade, researchers have debated whether Kenya's highlands are getting hotter—a question that might begin to explain why new cases of malaria rose dramatically in the 1980s and 1990s. In a paper published in *Malaria Journal* earlier this year, IRI scientist Judy Omumbo and her colleagues showed conclusively that the region had warmed by 0.6 degree Celsius since 1979. In short order they were able to resolve a question that others had wrestled with for years because they gained access to climate data from a regional tea plantation that had never before been analyzed. Omumbo worked closely with a researcher in the Kenya Meteorological Department who helped them analyze the data and who ultimately became a coauthor on the malaria paper. Collaborating in this way not only provides access to new data sets, it builds the scientific capacity within African institutions.

Tufa Dinku, an IRI researcher who was born in Ethiopia, has established similar collaborations in his home country. However, if these breakthroughs are to continue, policy makers must rethink current funding mechanisms for accessing Africa's climate data in order to ensure this information is available to those who stand to benefit from it. Thomson and her colleagues at IRI are not alone in their thinking. The Gates Foundation and the philanthropic arm of Google have also been pushing to open Africa's climate archive to the world.

Any solution also needs to guarantee that the national weather services are adequately funded to collect, distribute and support the data.



David Gottlieb



# VOLUNTEERS IMPROVE HEALTH INITIATIVES IN MILLENNIUM CITIES

**In 2010 five GlaxoSmithKline (GSK) employees lent their skills to the Earth Institute's Millennium Cities Initiative (MCI) by delivering vital social services in public health and education through GSK's PULSE Volunteer Partnership.**

The PULSE program builds upon GSK's mission—to improve the quality of human life through its products—empowering GSK employees to apply their knowledge and skills toward addressing the needs and challenges of impoverished rural and urban communities through a three- or six-month immersion experience. Following the success of the initial year of this partnership, in 2011 PULSE has provided 18 full-time volunteers to work with the Earth Institute.

One of the 2010 volunteers, Mayuko Hashimoto, a medical information specialist from Tokyo, completed a six-month immersion in Kisumu, Kenya. Hashimoto worked toward implementing a neonatal and maternal mortality survey in Kisumu's public health facilities. Working closely with MCI's public health specialist for Kisumu, Hashimoto assessed the existing capacity of Kisumu's four public health centers to provide delivery, neonatal, and maternal healthcare services for the city.

*The PULSE program builds upon GSK's mission—to improve the quality of human life through its products.*

Like Hashimoto, Noxolo Doris Tshambuluka of South Africa applied her own expertise in R&D and clinical health to conduct surveys on maternal and newborn mortality and institutional delivery in two Millennium Cities. After

spending three months in Mekelle, Ethiopia, Tshambuluka continued her much-needed work in Blantyre, Malawi.

Once aggregated, the data that Hashimoto and Tshambuluka gathered will assist local health officials in their work to reduce the incidence of maternal and neonatal morbidity and mortality in these cities.

Michelle Wobker, a pharmaceutical engineer in North Carolina, volunteered her talents for MCI's Kumasi-NYC School2School program. School2School is a public-private partnership among Columbia University Teachers College, New York



public schools, Ericsson and Airtel Ghana aimed at strengthening the uses of instructional technology in science and math education. To help address the need for capable teachers, Wobker helped train dozens of seventh-grade science, math, and IT teachers as well as assistant principals in 15 Kumasi middle schools, developing a groundbreaking teacher's guide to using the computer and the Internet.

Two GSK employees from Europe, Dorella Camiletti and Steffi Gantner, served as supply chain management consultants to the Metropolitan Health Directorates in Kumasi and Accra, Ghana's largest cities. Camiletti and Gantner devoted their efforts to reviewing existing systems within the two cities' health facilities, conducting inventory analyses and presenting recommendations to streamline performance and service delivery. Their efforts brought together stakeholders in Ghana's healthcare system to exchange information and share the most efficient practices in healthcare management.

In addition to the PULSE program, GlaxoSmithKline and the Earth Institute have embarked on a joint effort in the Millennium Villages Project (MVP) to apply the Personal Hygiene and Sanitation Education (PHASE) methodology in two MVP clusters in Malawi and Senegal. The goal of PHASE is to achieve behavior change around hand-washing, personal hygiene and sanitation to reduce morbidity and mortality and to improve overall sanitation infrastructure to support these practices.

GSK PULSE volunteer Michelle Staben Wobker in the midst of students dancing at the Parents' Day Celebration at the State Experimental Basic 1 and 2 in Kumasi, Ghana, in December 2010.



CEFC



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Monash Pictures

More than **30 interdisciplinary research centers and programs** are home to over

**850 scientists, postdoctoral fellows and students**

who work with the latest technology to

**deliver real-**



COLUMBIA 250

LEED  
Lamont Hall

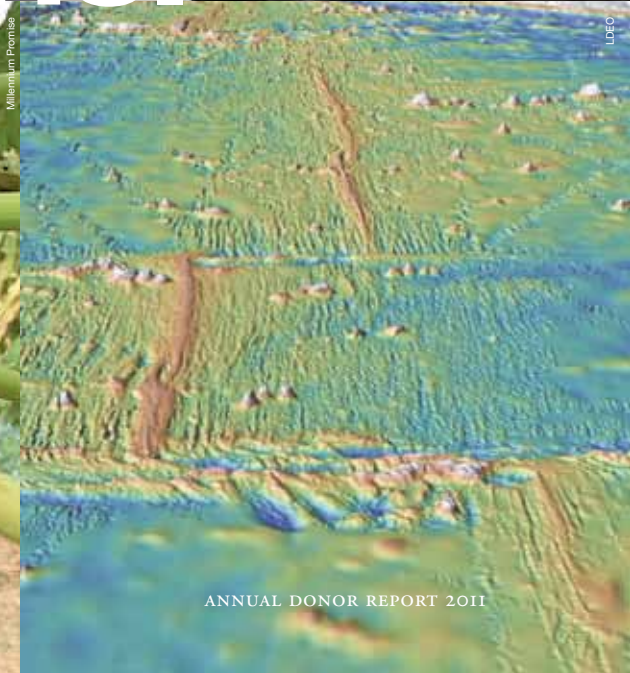


25

-world solutions.



Alan Orling



Millennium Promises

Alan Orling

LDFO

# EXTRAORDINARY SUPPORT FOR UNPRECEDENTED GLOBAL CHALLENGES

*With the extraordinary and sustained support of our donors and partners, we exceeded our \$200 million campaign goal almost a year ahead of schedule.*



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**Despite a slowed economic recovery we continue to make progress in our efforts to support and expand the educational and research programs and initiatives at the Earth Institute. With the extraordinary and sustained support of our donors and partners, we exceeded our \$200 million campaign goal almost a year ahead of schedule, ending the year having raised nearly \$23 million from individuals, corporations, foundations and organizations.** Thanks to this milestone the Earth Institute has expanded its campaign goal by \$100 million to \$300 million, to be completed by December 31, 2013. A transformational gift of \$10 million from Sue and Bill Gross has already given the expanded campaign a boost. They stated, “We are thrilled that our gift is helping kick off the expansion of the Earth Institute’s campaign and know that, with Jeff’s commitment, this will continue to be a good investment for humanity.”

Earlier this year Jeffrey Sachs announced that he would be extending his term as director. Since his tenure began in 2002, Jeff has led the Earth Institute to become a leading scientific authority on sustainable development while simultaneously expanding its reach worldwide. He has also forged an increasingly prominent role for academic leaders in policy

and program work throughout the world. Recognized globally as a leading figure on sustainable development and economics, Jeff’s advisement is sought out by global leaders, governments and the United Nations. He has significantly grown the Earth Institute’s programs both at home and abroad—increasing the number of major research units from six to 15, adding seven academic programs and more than tripling the membership of the Earth Institute faculty to nearly 40 experts.

On June 6, 2011, we welcomed Carol Pooser as the new director of funding initiatives. Carol comes to the Earth Institute from the University of Pennsylvania, where she was responsible for the major gift program for the School of Arts and Sciences. Over the past 20 years she has held leadership positions in research and higher education at institutions including the Marine Biological Laboratory at Woods Hole and the Florida Museum of Natural History. We are very excited to welcome Carol, whose personal and professional background make her a wonderful addition to the funding

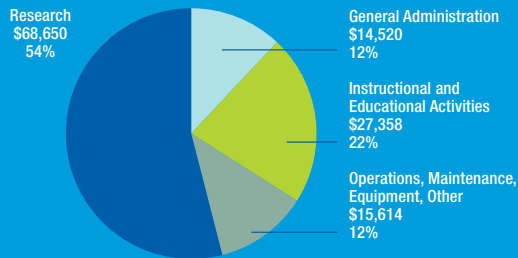
Above, front row, from left: Samantha Tress, Urania Mylonas, Terri Harris, Dove Pedlosky, Jasmina Metjaic. Back row, from left: Evan Phalon, Ronnie Anderson, Paula Sharp, Gregory Fienhold, Barbara Charbonnet, Carol Pooser, Lisa Phillips, Erika Freimuth, Stacey Vassallo.

## Financial Statement

July 1, 2010 – June 30, 2011

### Direct Expenses

\$126,141

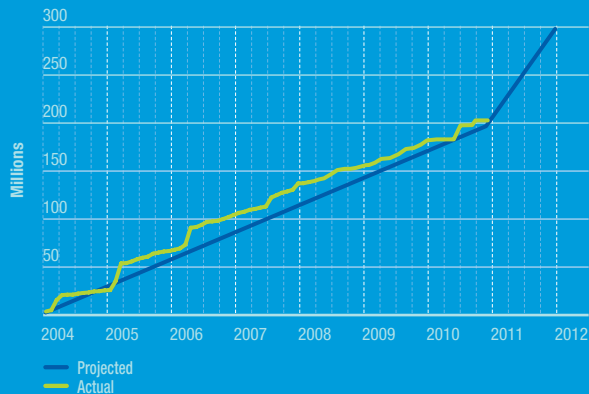
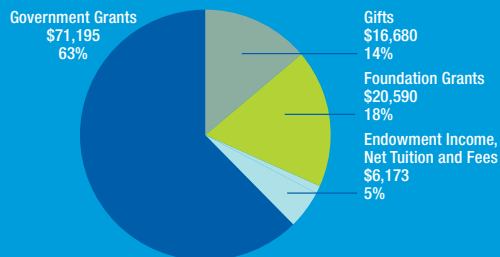


Dollar amounts in thousands.

Source: Office of Finance and Administration, The Earth Institute

### Direct Revenue

\$122,443



Elisen Barroso

Professor Jeffrey D. Sachs announces the extension of his term as Director of the Earth Institute to donors and supporters at President's House.

initiatives team and an ideal candidate to lead the development operation at the Earth Institute.

We were extremely pleased that the John D. and Catherine T. MacArthur Foundation awarded a \$1 million grant to help improve the health of mothers and children in poor, rural communities within the Millennium Villages Project (MVP). These funds will support activities to increase access to quality sexual and reproductive health services, continue our advisory work and assist governments with national scale-up programs and best practices throughout sub-Saharan Africa.

We were also gratified by Ikea's generous award of \$4.5 million in support of three additional Model Districts in Rajasthan, Bihar and Andhra Pradesh, India, projects focusing on key interventions for the survival of women and children, including care during pregnancy, safe deliveries, newborn care, immediate care for sick children and important nutrition interventions. The overall project goal is to support district and state governments to improve family health outcomes and serve as models for regional scale-up in an effort to accelerate national progress toward Millennium Development Goals in India, a country that carries the world's greatest burden of reproductive health, child health and nutrition issues.

## OUR DONORS

A generous gift from Karl G. Homberg of more than \$1.2 million has allowed the Columbia Climate Center to develop a master's level program in carbon management that aims to train the new workforce needed to meet the challenge of reducing carbon dioxide emission. The program will provide interdisciplinary understanding of the physical, natural and social sciences, engineering, economics, business and law and will be the first of its kind in the United States.

To secure the best resources for our researchers, we continue to prioritize fund-raising for the most advanced infrastructure. In 2010 the Lamont-Doherty Earth Observatory was awarded a \$1.4 million matching grant from the National Institute of Standards and Technology to complete the final laboratory in the Gary C. Comer Geochemistry Building. Once completed, this facility will be the most sophisticated ultra clean lab for geochemical analyses in academia, attracting top talent—students as well as professors—to the Observatory's campus. Such laboratories are essential to future innovation, facilitating opportunities for collaboration across the university and the wider international community. We are grateful to the more than 110 Lamont-Doherty alumni and friends who have made gifts or pledges totaling \$900,000 to meet the federal match. Among these, we extend special thanks to an anonymous donor, to the Botwinick-Wolfensohn Foundation, to George L. Becker Jr. and his family and to the Office of Columbia's Executive Vice President for Research.

With 30 percent of our \$300 million campaign goal yet to be raised, the continued commitment of our loyal donors and friends will be instrumental in helping us meet our 2013 goal. More importantly, these funds will help us train the next generation of leaders and enable our world-class scientists and staff to continue their important work to secure a more sustainable Earth.



### Thank You to Our Donors

We greatly appreciate the support of donors like you, the individuals, corporations, foundations, foreign governments and multilateral organizations who have supported and partnered with us in our work. With your help, we continue to advance the science, technologies and policies needed to develop practical solutions for our planet's complex challenges. You are part of an invaluable group of supporters who have been instrumental in allowing us to continue to find solutions to achieve sustainable development.



“In recent years, Sue and Bill Gross have donated more than \$15 million in support of Millennium Villages and other projects. ‘We’re happy to support the Earth Institute,’ they say, ‘and to play a role in helping bring hope and self-sufficiency to some of the poorest people on the planet who face almost insurmountable odds in achieving better lives for themselves and their families.’ The Grosses’ generosity helps empower hundreds of thousands to fight poverty and transform their lives. Through critical and creative ways, their donation will go to expanding the project throughout Africa.”

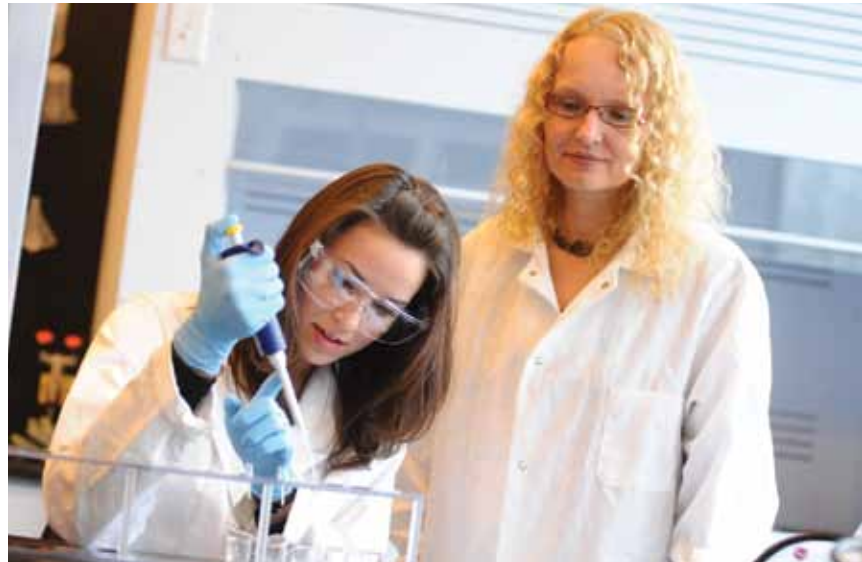
—Jeffrey D. Sachs

# MORE EARTH INSTITUTE PROJECTS AND INITIATIVES

**The Earth Institute  
comprises more than  
30 research centers  
and programs.  
Here are a few more  
highlights of the many  
projects we have  
conducted during the  
last year.**

**Visit us online at  
[earth.columbia.edu](http://earth.columbia.edu)  
for regular updates  
on our work.**

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Elisen Barroso



The island nation of Timor-Leste.

## **MANAGING OIL IN TIMOR-LESTE**

Though rich in oil and gas, the young island nation of Timor-Leste is one of the least developed countries in the world. The government, in an effort to boost public investment and achieve higher living standards, reached out to Jeffrey Sachs, the Earth Institute and the Vale Columbia Center on Sustainable International Investment for advice on the sustainable management and use of its petroleum resources. With the support of the Open Society Institute, a cross-disciplinary advisory team is supporting the government's efforts to achieve rapid, sustainable development and build a diverse economy.

## **TOP-RATED EARTH SCIENCE PH.D. PROGRAM**

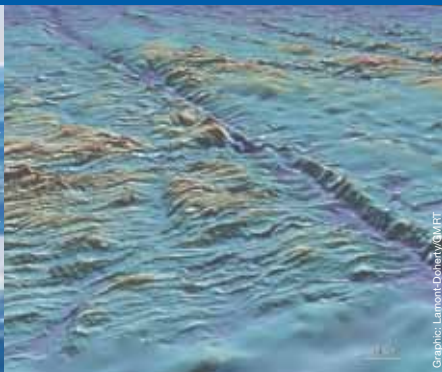
As the Lamont-Doherty Earth Observatory (LDEO) seeks to endow its newly titled Lamont Research Professor track, its cadre of innovative researchers and mentors was recognized by the wider community. In September 2010 the National Research Council announced that Columbia's collaborative Earth Science Ph.D. training program, co-led by LDEO researchers and the faculty of the Department of Earth and Environmental Sciences, had been rated the best such program in the country.

This partnership between a world-class research institute and a distinguished academic program trains generations of young scientific leaders, renowned throughout the world for outstanding achievements and a history of problem-solving, discovery and creativity.





Nick Ferguson, Lamont-Doherty Earth Observatory



Graphic: Lamont-Doherty Earth Observatory



Amikha Sweetland

## CARBON MANAGEMENT PROGRAM

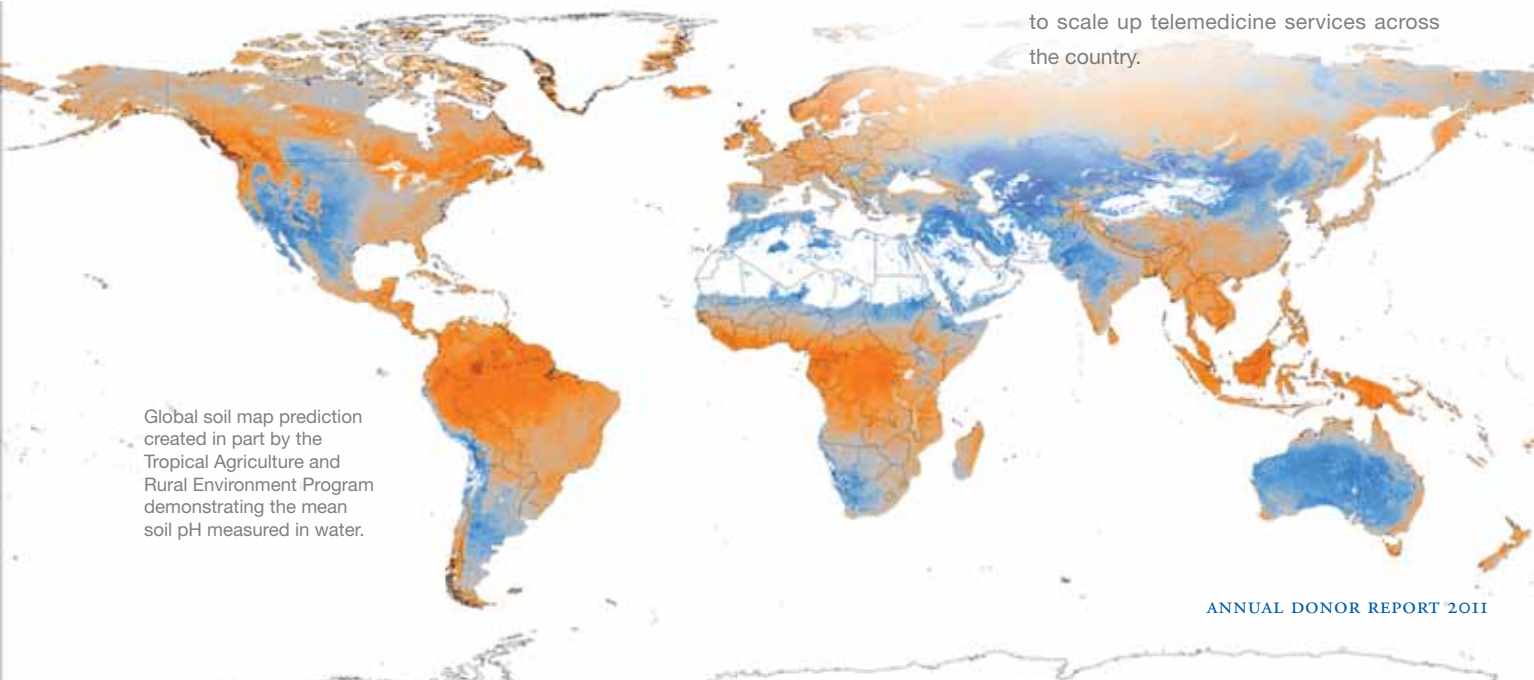
The new low-carbon economy requires an innovative workforce of engineers, forest scientists, economists, lawyers, policy makers and financial experts who understand that climate-related decisions have global impact. With the support of donor Karl G. Homberg, a new Carbon Management program is being developed at the Earth Institute. The two-year, multidisciplinary curriculum will train professionals to navigate the scientific, technical, behavioral, economic and policy dimensions of the carbon challenge.

## GOOGLE OCEAN

Since the late 1950s, when researchers at the Lamont-Doherty Earth Observatory (LDEO) developed the first topographic maps of the ocean bottom, the Observatory has been at the forefront of seafloor exploration. Now Google and LDEO have joined forces to improve the seafloor topography of Google Ocean to allow armchair explorers to view parts of the deep ocean floor in greater detail than ever before. Oceanographers at LDEO spearheaded the project, which compiles data collected on hundreds of U.S. research cruises and generates the imagery for Google Ocean's advanced feature.

## GHANA TELEMEDICINE PROJECT TO BOOST HEALTH IN BONSAASO

The Ghana Telemedicine Project, supported by the Novartis Foundation, will provide critical healthcare services to the Millennium Village of Bonsaaso, Ghana, through information and communications technology. The project will use existing mobile health platforms, such as ChildCount+, a system that uses text messages to deliver patients' vital health information from phones to databases. Additionally a new teleconsultation center will provide support to health workers in clinics as well as to community health workers engaged at the household level. Best practices from the Millennium Villages project will inform the development of the project and demonstrate results to the Ministry of Health in Ghana as it looks to scale up telemedicine services across the country.



Global soil map prediction created in part by the Tropical Agriculture and Rural Environment Program demonstrating the mean soil pH measured in water.

## RESEARCH CENTERS AND PROGRAMS

### Research Units of the Earth Institute

---

Center for Climate Systems Research (CCSR)  
Center for Environmental Research and Conservation (CERC)  
Center for Global Health and Economic Development (CGHED)  
Center for Hazards and Risk Research (CHRR)  
Center for International Earth Science Information Network (CIESIN)  
Center for National Health Development in Ethiopia (CNHDE)  
Center for Rivers and Estuaries  
Center for Sustainable Urban Development (CSUD)  
Center for the Study of Science and Religion (CSSR)  
Center on Globalization and Sustainable Development (CGSD)  
Columbia Climate Center  
Columbia Water Center  
Earth Engineering Center (EEC)  
International Research Institute for Climate and Society (IRI)  
Lamont-Doherty Earth Observatory (LDEO)  
Lenfest Center for Sustainable Energy (LCSE)

### Programs of the Earth Institute

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Cross-Cutting Initiative (CCI)  
Earth Clinic  
Millennium Cities Initiative  
Millennium Villages Project  
Program on Science, Technology, and Global Development  
Roundtable on Sustainable Mobility  
Tropical Agriculture and Rural Environment Program  
M.A. in Climate and Society  
M.P.A. in Development Practice  
M.P.A. in Environmental Science and Policy  
M.S. in Sustainability Management  
Ph.D. in Sustainable Development  
Undergraduate Special Concentration and Major in Sustainable Development

### Joint Units of the Earth Institute

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The following five units were established jointly by the Earth Institute and a second entity:  
Center for Research on Environmental Decisions (CRED)  
Cooperative Institute for Climate Applications and Research (CICAR)  
Laboratory of Populations  
Urban Design Lab (UDL)  
Vale Columbia Center on Sustainable International Investment

### Affiliates and Consortia

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The Earth Institute is a member of or is closely affiliated with the following four entities:  
Advanced Consortium on Cooperation, Conflict and Complexity (AC4)  
Black Rock Forest Consortium  
Center for Climate Change Law (CCCL)  
NASA Goddard Institute for Space Studies (GISS)

## DIRECTORATE

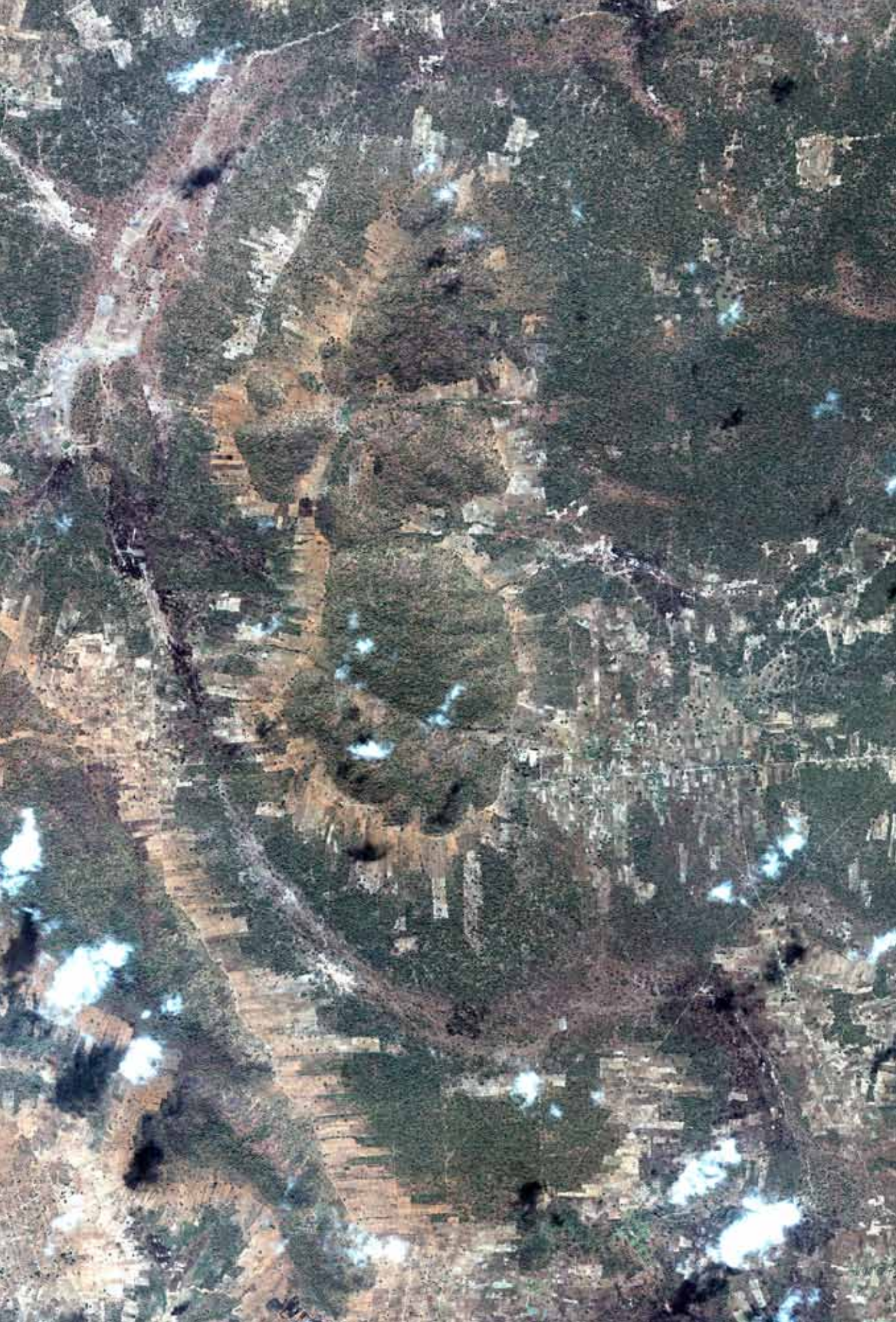
Jeffrey D. Sachs  
*Director*  
Steven Cohen  
*Executive Director and Chief Operating Officer*  
Peter Schlosser  
*Associate Director and Director of Research*

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Steven Cohen  
*(Chair)*  
Joanna Rubinstein  
David C. Dvorak  
Judith Pietrasiewicz  
Carol Pooser  
Louise Rosen  
Erin Trowbridge

Remote sensing imagery of the Mbola Millennium Village in Tanzania.





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