

## GEOLOGICAL HAZARDS SECTOR UPDATE



During a VDAP response in Costa Rica, a scientist uses a thermal camera to image the plume of Turrialba Volcano. Photo courtesy of VDAP

### VDAP Responds to Volcanic Crises Worldwide

For the past 30 years, the U.S. Geological Survey (USGS) has implemented the USAID/OFDA-funded Volcano Disaster Assistance Program (VDAP), one of the world's only volcano crisis response teams. USAID/OFDA and USGS established VDAP following the 1985 eruption of Nevado del Ruiz Volcano in Colombia, which resulted in an estimated 23,000 deaths. Since 1986, USAID/OFDA has provided more than \$33 million to support VDAP, including more than \$4 million in Fiscal Year (FY) 2016. To date, VDAP teams have responded to 30 major crises and strengthened response capacity in 12 countries. VDAP scientific teams travel to volcanoes throughout the world at the request of host governments and, using volcano-monitoring equipment, work with local and national counterparts to quickly assess hazards and generate eruption forecasts.

Activity at Turrialba Volcano, located 40 miles east of Costa Rica's capital city of San José, increased significantly in mid-May of 2016. A series of explosions sent plumes of ash and gas nearly two miles above the main crater, creating a significant hazard for air traffic into San José. In response to a request from the Government of Costa Rica, VDAP deployed two USGS scientists to support Costa Rica's Volcanological and Seismological Observatory (OVISCORI) in late May. Working with OVISCORI, the VDAP team helped determine that there was a low risk of harm to residents of San José, suggested procedural and policy recommendations, and supported OVISCORI to use infrared and radar tools to better detect ash-producing eruptions. A VDAP team returned to Costa Rica in July to install two infrasound sensors near Turrialba. As of August 2016, VDAP continued to assist OVISCORI as it monitored activity at Turrialba. More information about VDAP is available at: <http://volcanoes.usgs.gov/vdap>.

### Sector Overview

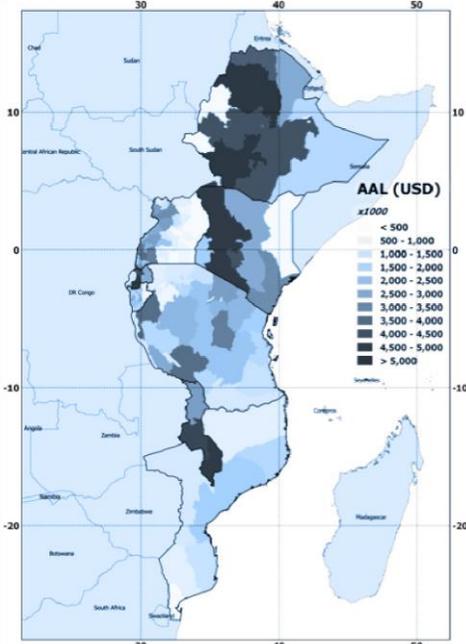
Geological hazards—including earthquakes, landslides, and volcanoes—threaten millions of people worldwide and can devastate communities in a matter of seconds by destroying homes, causing food and water shortages, and disrupting livelihoods. Although geological hazards cannot be prevented, proper mitigation and preparedness efforts can minimize the effects of disasters by saving lives, promoting resilience, and reducing the negative economic effects of geological events.

In FY 2016, USAID's Office of U.S. Foreign Disaster Assistance (USAID/OFDA) provided nearly \$5.3 million for geological hazards activities, including geological disaster risk reduction (DRR) programs that emphasize a comprehensive approach that ranges from identifying potential hazards in advance of events to helping communities and households reduce the impact of geological disasters. USAID/OFDA-supported geological DRR activities include monitoring events such as volcanic eruptions and earthquakes, supporting early warning systems, and educating at-risk populations and community leaders on effective response procedures.



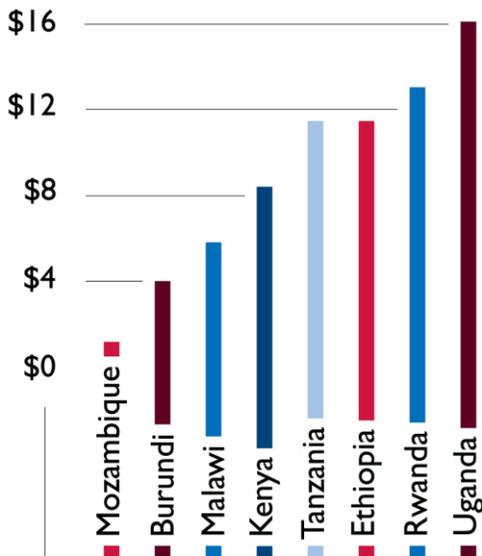
Indonesian colleagues fly a small unmanned aerial system over the crater of Kelud Volcano, Indonesia, to acquire imagery for a digital elevation model of the volcano. Photo courtesy of VDAP

## Earthquake Risk in East Africa



Average annual economic losses (USD) at the first administrative level for the eight countries in the SSAHARA project. Graphic courtesy of GEM

## Aggregated Losses (in millions)



Comparison of aggregated losses per country, demonstrating that Uganda has the highest economic risk in the event of an earthquake, on an average annual basis. Graphic courtesy of GEM

## Providing Earthquake Risk Management and Assessment Training in Africa

With nearly \$500,000 in FY 2016, USAID/OFDA continued support for the Global Earthquake Model Foundation (GEM)—a public-private partnership that aims to establish uniform and accessible standards for calculating and communicating the risk of an earthquake occurring in a particular area. GEM's mission is to encourage the design, development, and deployment of state-of-the-art tools for earthquake risk assessment. GEM produces decision-making models that allow users to process earthquake risk information, inform decision-making, and reduce potential loss of life and damage to livelihoods and economies. More information about GEM is available at: <http://www.globalquakemodel.org>.

In the last century, Africa experienced more than 80 earthquakes that resulted in the deaths of an estimated 21,000 people, left nearly 1 million people homeless, and caused economic losses exceeding \$12 billion. With USAID/OFDA support, GEM is building capacity for earthquake risk assessment and management in Africa through the Sub-Saharan Africa Hazard and Risk Assessment (SSAHARA) project. In FY 2016, GEM organized a variety of events, including an urban resilience workshop for 60 local representatives in Addis Ababa, Ethiopia, and a meeting with experts to discuss earthquake hazard modelling in Africa. In addition, GEM trained 23 participants from 11 sub-Saharan countries in risk assessment modeling from June 27 to 29. By the end of the training, participants had learned about GEM resources and prepared risk assessments for their respective countries. On June 30, trainees from Rwanda and South Africa presented their models at an international symposium on risk management hosted by the African Union.

## Supporting Seismic Monitoring in Earthquake-Prone Burma and Chile

With support from USAID/OFDA, USGS is reducing the risks posed by earthquakes through the utilization of the Earthquake Disaster Assistance Team (EDAT)—comprising geologists, seismologists, and tsunami and landslide experts, as appropriate. To date, EDAT members have collaborated with scientists in China, Comoros, Haiti, Indonesia, Malawi, Nepal, and Turkey, among other earthquake-prone countries. The scientific data produced from EDAT and local counterpart assessments improves the understanding of seismic hazards and serves as the basis for the development, adoption, and implementation of appropriate building codes and land-use plans, which—when properly implemented—can reduce the adverse impacts of earthquakes.

Burma lies in a highly active seismic zone. To improve seismic hazard assessments and reduce earthquake-related risks in the country, EDAT worked with the Government of Burma (GoB) in FY 2016 to strengthen the national seismic network. In January, EDAT installed state-of-the-art monitoring equipment at five remote sites selected by the GoB Department of Meteorology and Hydrology. Recent earthquakes, including a magnitude 6.9 earthquake in April and a magnitude 6.8 earthquake in August, showed that the network was working and producing data that can eventually be used to create risk maps, helping reduce earthquake risk in the country.

In Chile, EDAT is piloting a project that utilizes inexpensive smart phone technology to provide rapid situational awareness. The project transmits time-critical scientific earthquake information to scientists for use in automated alerts, as well as to inform mitigation and rapid response decisions. As of August 2016, 14 of 200 stations had been installed, covering more than 340 miles of Chile's coast. The instruments have successfully detected earthquakes as low as magnitude 5.0, exceeding original expectations.

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