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EVALUATION

Final Report: Evaluation of the USAID/OFDA-USGS Volcano Disaster Assistance Program in Indonesia

November 2012

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EVALUATION OF THE USAID/OFDA USGS VOLCANO DISASTER ASSISTANCE PROGRAM IN INDONESIA

Contracted under RAN-I-00-09-00016-00, Task Order Number AID-OAA-TO-12-00038 Evaluation of the USAID/OFDA - USGS Volcano Disaster Assistance Program in Indonesia.

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DISCLAIMER
The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

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GLOSSARY OF TERMS

Term	Definition
Crisis	A crisis is a period of increased danger where there is a possibility the volcano will create a danger that exceeds some predetermined reference level. Volcano warnings are used to convey this information.
Deformation	One of the principal phenomena monitored at volcanoes. The surface of the volcano responds to changes within the interior of the volcano or deeper in the magma chamber. The volcano can swell (inflate) or subside (deflate) to allow inferences to be made about the magma pressure.
Disaster	A volcanic disaster is a calamity that results in great loss, ruin or misfortune.
Disaster Risk Reduction (DRR)	A generic term for national mechanisms for coordination and policy guidance on reducing disaster risk that are multi-sectoral and inter-disciplinary in nature, with public, private and civil society participation involving all concerned entities within a country.
Dome	A steep-sided mount that forms when very viscous lava is extruded from a volcanic vent.
EARTHWORM	Software system for integrating regional seismic network data and regional data acquisition.
Early Warning System (EWS)	Disaster early warning systems provide advanced notice of an impending disaster. The early warning (1) provides time for people to take response actions, and (2) initiates a wide variety of response actions to mitigate the harmful effects of disasters.
Exclusion Zone	An area evacuated after a disaster, or an area deemed high risk such that building is forbidden.
Fumaroles	A vent that releases volcanic gases, including water vapor (steam).
Forecast	Definite statement or statistical estimate of the likely occurrence of a future event or conditions for a specific area.
Flyspec	A small ultraviolet spectrophotometer that measures sulfur dioxide emissions.
Gas Monitoring	Certain constituents of volcanic gases may show very early signs of changing conditions at depth, making them a powerful tool to predict imminent unrest. Used in conjunction with monitoring data on seismicity and deformation, correlative monitoring gains great efficiency.
Gender	The set of characteristics, roles and behavior patterns that distinguish women from men which are constructed not biologically but socially and culturally.
Gender Equality	A transformational development goal, gender equality is understood to mean that women and men enjoy the same status on political, social, economic and cultural levels. It exists when women and men have equal rights, opportunities and status.
Gender Equity	The process that leads to gender equality
Global Positioning System (GPS)	A navigation system that allows the location of a point on the earth's surface to be determined precisely. A receiver obtains signals from satellites to monitor long term deformation of the volcano's flanks.
Hazard	Geological process or phenomenon that may cause loss of life, injury or other

Term	Definition
	health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.
Hazard Zone	An area potentially affected by a hazard.
Hyogo Framework for Action	The main outcome of the World Conference on Disaster Reduction January 2005 in Kobe, Hyogo, Japan was The Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters
LAHARZ	Software program for modeling volcanic debris flow and impact.
Lahar	A torrential flow of water-saturated volcanic debris down the slope of a volcano in response to gravity. A type of mudflow.
Landscan	Gridded global population database with a resolution to approximately 1 km census data distributed within the tracts based on land cover, proximity to roads, slope and nighttime lights.
Mitigation	The lessening or limitation of the adverse impacts of hazards and related disasters.
Prioritas Pemantauan (PP)	Monitoring priority based on likelihood of erupting, history of intensity, and proximity to populations. CVGHM scoring/ranking: PP1 is densely populated, PP2 less so, PP3 very low.
Predict	An estimate that (a specified thing) will happen in the future or will be a consequence of something.
Pyroclastic Flows	A hot, fast-moving and high-density mixture of fine and coarse particles and gas formed during explosive eruptions or from the collapse of a lava dome.
Radio Telemetry	The measurement of data at a remote source and transmission of the data (typically by radio) to a monitoring station.
Risk	The combination of the probability of an event and its negative consequences.
Response	The provision of emergency services and public assistance during or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected.
SEISAN	A software tool used for monitoring the epicenter and magnitude of a volcanic tremor or earthquake.
Seismicity	Pertaining to earthquakes or earth vibration.
Seismograph	A scientific instrument that detects and records vibrations (seismic waves) produced by earthquakes.
Science Diplomacy	The use of scientific collaborations among nations to address common problems and to build constructive international partnerships.
SWARM	Program for real-time seismic wave pattern analysis.
Synthetic Aperture Radar (SAR)	Airborne or satellite radar systems that use a single small moving antenna to create large "virtual" antennae. Provide high resolution terrain images – through atmospheric or volcanic clouds.
Tephra	Solid material of all sizes explosively ejected from a volcano into the atmosphere.
Threat	Qualitative risk posed by a volcano to people and property (independent of mitigation efforts).
Tiltmeter	An instrument that measures change in the angle between the slope of a part of a volcano and some reference. The reference may be the slope of the volcano at some previous time.

Term	Definition
Unrest	Abnormal geophysical or geochemical activity since the last eruption.
Volcano Monitoring	A combination of activities and tools that help build an understanding of risk surrounding a particular volcano. Historical and current signs of unrest (activity) collected from networks of instruments can be analyzed and the data interpreted to provide a background for determining when and how a volcano might erupt.
Volcanic Explosivity Index (VEI)	The volcanic explosivity index is a scale from 1 to 8 used to measure the magnitude (erupted volume) and intensity (eruption column height) of an eruption. The VEI is not used to describe eruptions of lava which are non explosive.
VSAT	A Very Small Aperture Terminal (VSAT) is a two-way satellite ground station or a stabilized maritime VSAT antenna with a dish antenna that is smaller than 3 meters.

ACRONYMS

AIFDR	Australia-Indonesia Facility for Disaster Reduction (AusAID)
AFM	Acoustic Flow Monitor (for tracking lahar movement)
BG	Badan Geology (Geological Agency) Ministry of Energy and Mineral Resources in Jakarta
BNPB	Badan Nasional Penanggulangan Bencana (National Disaster Management Agency)
BPBD	Badan Penanggulangan Bencana Daerah (Provincial Level Disaster Management Agency)
BPPTK	Balai Penyelidikan dan Pengembangan Teknologi Kegunungapian (Center for Volcanic Investigation and Technological Development): Yogyakarta Volcano Center
CSAV	Center for the Study of Active Volcanoes, University of Hawaii at Hilo
CVGHM	Indonesian Center for Volcanology and Geologic Hazard Mitigation (formerly the Volcanological Survey of Indonesia)
CVO	USGS Cascades Volcano Observatory (VDAP home)
DART	USAID Disaster Assistance Response Team
DCHA	USAID Bureau of Democracy, Conflict, Humanitarian Assistance
DIY	Daerah Istimewa Yogyakarta (Special Region of Yogyakarta)
DRR	Disaster Risk Reduction
FPRB	Forum Pengurangan Resiko Bencana (Disaster Risk Reduction Forum)
GIS	Geographic Information System
GPS	Global Positioning System
INVEWS	Indonesian National Volcano Early Warning System
KKVO	Kakaskasen Volcano Observatory, Tomohon, North Sulawesi
McVCO	Microcontroller based Voltage Controlled Oscillator
NDMA	National Disaster Management Agency
USAID/OFDA	Office of U.S. Foreign Disaster Assistance (USAID)
PAPA	Participating Agency Program Agreement (inter USG funding mechanism)
PP1, PP2, PP3	Prioritas Pemantauan (Population density around volcanoes - CVGHM scoring/ranking. PP1 is densely populated, PP2 less so, PP3 very low.)
PVMBG	Indonesian Center for Volcanology and Geologic Hazard Mitigation (Indonesian language version of CVGHM acronym)
QR	Quarterly Reports
SEISAN	SEISmic ANalysis
USAID	United States Agency for International Development
USGS	United States Geological Survey
VCO	Voltage controlled oscillator
VDAP	Volcano Disaster Assistance Program

VEI	Volcanic Explosivity Index
VPI	Volcano Population Index
VSI	Volcano Survey of Indonesia (former name for CVGHM – still widely used)

EXECUTIVE SUMMARY

The United States Agency for International Development (USAID), Bureau for Democracy, Conflict, and Humanitarian Assistance (DCHA), Office of U.S. Foreign Disaster Assistance (USAID/OFDA) commissioned this evaluation of the joint USAID/OFDA and US Geological Survey (USGS) Volcano Disaster Assistance Program (VDAP) in Indonesia to guide VDAP programming and determine appropriate future funding levels. The primary mission of this interagency cooperative program is to reduce eruption-caused fatalities and economic losses in developing countries. VDAP crisis response comprises consultation with host-country colleagues, a rapid hazard assessment of the area, provision of needed monitoring equipment, and activation of available remote sensing resources. Forecasts on volcanic hazards and risks are made using the volcano's history, instrumental monitoring to detect the movement of magma toward the surface, and the VDAP team's extensive knowledge of volcanoes worldwide. All of this activity is conducted with the host country's volcanologists taking a prominent lead role. The goal of VDAP's work in Indonesia is to strengthen local volcano monitoring, mitigation, and response capacity through technical assistance to the Indonesian Center of Volcanology and Geological Hazard Mitigation (CVGHM). Within the 26 year history of work in Indonesia, the evaluation was focused on three components of this work: Capacity building in North Sulawesi from 2004 to 2010; Capacity building in Java from 2010 (on-going) and crisis response at Merapi Volcano in Yogyakarta, Central Java in 2006 and 2010.

EVALUATION ACTIVITIES

The purpose of the evaluation mission was to conduct an independent review of VDAP's work in Indonesia. This amounted to a review of the completed work in Northern Sulawesi; of the similar work recently begun in Java; and of the crisis response to two Merapi eruptions in 2006 and 2010. Despite the complex differences in activities and time frame, the overall evaluation tests the hypothesis that ***all*** VDAP activities and inputs are leading toward self-sufficiency in Indonesian crisis response, and thus, ***all*** were seen to be part of that ***process***. A process-based evaluation approach was used, then, to understand how each of these programs works within the whole to deliver its ultimate result, i.e., capacity building in Indonesian crisis response. Our process-based evaluation approach used questions like the following to delve deeper into the much broader questions provided by the scope of work (see Annexes A and B):

- What is required to deliver the program in terms of resources, products, and services?
- How are individuals implementing the intervention trained?
- How are participants selected?
- What are considered the program's strengths and weaknesses?
- What is the feedback from participants and partners about the implementation of the program?

The methodology for this evaluation is set out in a detailed plan (see Annex B) and focused on five criteria: overall performance (effectiveness) and impact, efficiency, coverage and design (relevance), sustainability, and gender equity. In addition the evaluation reviewed evidence for cross-cutting themes such as science diplomacy and training. Despite the three disparate programs, the methodology allocated most resources to the five focus criteria highlighting lessons that will inform ongoing implementation. The field portion of this evaluation was conducted over a six week time frame by a small team including a volcanologist, an Indonesianist and anthropologist, a social scientist with USAID/OFDA experience, and three Indonesian professionals who specialized in evaluation, disaster response, and logistics.

CONCLUSIONS

Overall Performance and Impact

- Overall performance was outstanding and impact is substantial. Strategic objectives as defined in the annual work plans under the Interagency Agreements were achieved and frequently exceeded, both in number of activities and timing. The evaluation team found evidence of sustained strengthened capacity of Indonesian authorities to monitor and respond to volcanic crises. Although exact numbers are difficult to calculate, VDAP assistance likely contributed to saving 15,000 lives during the Merapi crisis response in 2010 alone.
- With modest financial investment, VDAP in Indonesia has demonstrably enhanced the capabilities and stature of the national volcano monitoring organization, and through its crises responses, has saved lives.
- CVGHM's and GOI's capacity to understand, forecast, prevent and respond to volcanic crises was improved.
- As a direct result of VDAP-provided equipment and training, CVGHM has improved both crisis response (e.g. Merapi 2010), and the competence to avoid unnecessary evacuations, based on improved information and skills (e.g. Soputan in 2011 and Raung in 2012).

Overall Performance: Lives Saved

- The impact of VDAP's capacity building and some crisis response work is both long-term and indirect and therefore is difficult to quantify. In the case of the Merapi crisis response in 2010, however, VDAP provided critical information that was used to expand the evacuation zone, saving approximately 15,000 lives. Overall, with beneficial VDAP provided skills, such as the ability to more deeply analyze seismicity using the EARTHWORM software, to analyze risk through probability trees, and to increase lahar hazard warnings through VDAP-provided monitoring equipment (see Annex D for more), Indonesian volcanology has vastly improved its overall performance – which is evidence of a very successful implementation of VDAP objectives.
- In general, lives and property saved and livelihoods protected cannot be attributed directly to VDAP assistance, although there is some causality demonstrated by the increase in GOI capacity, which is the ultimate sign of success in VDAP's work in Indonesia.

Efficiency

- VDAP assistance is efficient and cost-effective, given the relatively low investment (approximately $1.25 million average annually over the past seven years for work worldwide) to support salaries, training, travel, cache and equipment, and crisis response.
- Limited resources (donated equipment, training, cooperative work) are utilized sparingly to maximize effectiveness. VDAP is viewed as a leader by the GOI and other donors, whose work and coverage is coordinated by CVGHM, and undertaken cooperatively to minimize duplication and gaps. Unlike other donors that focus on their own research programs, VDAP cooperates with CVGHM and donates all of the monitoring equipment brought into the country.
- According to informants, much of the VDAP impact is in intangible benefits that include improved safety and confidence, scientific knowledge improvement and exchange, and bilateral trust and goodwill.

Coverage and Design: Relevance

- VDAP works in close partnership with CVGHM, and planning, priorities and location are jointly determined through a long-term negotiation process. Since geological hazard monitoring is a

government agency activity, there are no alternatives to CVGHM beyond the academic route, which is beyond VDAP's scope in Indonesia.

- The regional network capacity building focus in the North Sulawesi program is viewed by CVGHM as a model and is now being replicated in Java and across the archipelago. As appropriate, the primary beneficiary group is CVGHM staff and scientists. Secondary beneficiaries include broader risk mitigation groups and at-risk populations. Respondents indicated that VDAP support is relevant, timely, practical and most of all, consistent.
- Responding to requests from the GOI, VDAP design has been flexible, expanding from crisis response only, to capacity building in North Sulawesi and then to Java.
- Respondents indicated that VDAP design is well-suited to Indonesian needs: evidence includes successful history of close communication, negotiation of needs and mutual respect.

Sustainability

- Improved capacity of the CVGHM to respond to volcanic crises and to mitigate risk has been demonstrated both in crisis response (esp. Merapi 2010,) as well as the avoidance of unnecessary evacuations and risk based on improved information and skills (e.g. Soputan 2011 and Raung, 2012).
- The newly established Kakaskasen Volcano Observatory (KKVO) is Indonesia's first regional network, linking 10 active volcanoes, providing real time data to the KKVO hub and CVGHM in Bandung. Overall, 13 new seismic stations and other monitoring equipment have been donated and installed. Equipment is being maintained, repaired and replaced by Indonesians without VDAP involvement. Over 90% of VDAP trainees report they have passed their new skills on to others.

Gender Equity

- VDAP had no direct role in ensuring gender balance in program involvement. Neither CVGHM nor VDAP has control over civil service hiring policies, but both support gender-neutral responsibilities and assignments within appropriate cultural contexts. Approximate numbers of female employees at CVGHM are only about 5% of all staff, but at Balai Penyelidikan dan Pengembangan Teknologi Kegunungapian (BPPTK), women make up 65% of the workforce, possible due to its urban location. In both locations, however, men and women hold balanced numbers of senior positions.
- Observers who serve in often- isolated posts away from families are all men.
- VDAP and CVGHM adhere to government policies of non-discrimination in hiring and advancement, assignments, and training opportunities.
- 98% of survey respondents agreed that men and women enjoy equal access to work and advancement.

Cross-Cutting Issue: Training

- VDAP's mix of training techniques, including primarily one-on-one cooperative learning by doing field equipment installation, with some formal workshops and classes, offers tightly focused technical training and long-term follow-up mentoring, reinforcement and support.
- Trainees responded favorably to methods, content, quality, and appropriateness of training.
- However, records of training needs and priorities, curriculum, attendance, results (skills, knowledge and attitudes), frequency, and gender participation were not maintained, making assessment and evaluation difficult.

Cross-Cutting Issue: Science Diplomacy[1]

- VDAP represents the strong and supportive role of US science diplomacy in Indonesia. VDAP scientists work with and within GOI structures and are acknowledged and appreciated for their supportive technical assistance, their collaborative approach.
- VDAP work contributes to US diplomacy through building scientist to scientist relationships.
- VDAP's work is considered non-political, non-intrusive, and non-judgmental of Indonesia's strengths and weaknesses in relation to hazard monitoring. VDAP is seen as having very positive benefits by achieving its goals. VDAP is thoroughly respected and this non-threatening position has led to deep trust.
- Evidence for successful science diplomacy includes senior level exchanges, dozens of co-authored collaborative research publications, mutual adaptation and sharing of technology regular and informal communication and close working relationships.

Conclusions: North Sulawesi

- As the first regional network in Indonesia, VDAP succeeded in creating a functioning telemetry system that allows for centralized monitoring of ten volcanoes in a very difficult to reach area. VDAP provided seismometers, radio repeaters, solar panels and other equipment and expanded data transmission bandwidth so that KKVO can now transmit three times as much data to CVGHM in real time, thereby advancing seismic monitoring and interpretation abilities and improving public safety. Equipment is being maintained by Indonesian staff.
- VDAP provided one-to-one equipment installation and workshop training in seismic deformation, and gas monitoring. The trainees (mostly from CVGHM-Bandung) have subsequently trained other staff. This is a model for training technicians anywhere, and will certainly be applicable to Java. Better communications capabilities in Java will allow more sophisticated network design training.

Conclusions: Java

- The original program to monitor eight volcanoes was reduced to six when two were ceded to Earth Observatory Singapore for monitoring purposes. The selected volcanoes have better access to roads, power, and communications than those in North Sulawesi. Prehistoric volcano history is not known at these volcanoes, impeding thorough understanding of eruptive history.
- Still in its early stages, the evaluation team only saw VDAP input at Tangkuban Perahu volcano. Increased activity at this volcano in 2011 showed how VDAP-trained technicians were able to install and use equipment on their own to effectively respond to developing unrest.
- The numbers of volcanoes to be monitored and their accessibility makes this work easier than what was accomplished in North Sulawesi.
- Less effort per volcano will be required for seismic station installation.
- Geologic mapping is needed with chronology.
- Observers need broader-focused training in order to understand "their" volcanoes better.

Conclusions: Merapi

- Improved crisis response is the ultimate goal of the Indonesia capacity building program. When invited to assist, VDAP does quick analyses of needs, meets those needs and ensures the host agency retains

[1] Science Diplomacy is the use of scientific collaborations among nations to address common problems and to build constructive international partnerships.

all credit for a job well done. During both of these eruptions, Indonesian scientists used VDAP support to good effect and successfully saved around 15,000 lives in 2010.

- Lessons from Merapi have dramatically changed risk mitigation in Indonesia.
- For the first time, near-real-time satellite radar imagery played an equal role with seismic, geodetic, and gas observations in monitoring activity during a major volcanic crisis, firmly cementing VDAP – CGVHM – BPPTK relationships.
- VDAP input has a clear impact on numbers of lives saved and on capacity building for Indonesian independence in crisis response, *but* it has no effect on saving livestock, farms, homes, infrastructure and other local livelihoods. These domains are those of the local government and disaster agencies.

RECOMMENDATIONS – OVERALL

General

- Plan to continue support to VDAP through the proposed 2012-2017-work plan, but respect the CVGHM Blueprint, which calls for complete monitoring systems at all PP1 volcanoes (i.e., those 76 volcanoes with high priority risk through proximity to populous areas), improved capacity for observers, and increased ability to make and procure their own instruments by 2014. CVGHM plans to be self-sufficient in basic seismic monitoring instrumentation by then.
- VDAP and GOI develop a strategic plan to cover the period of 2012-2017. Elements of this plan should include an overall goal statement and strategic objectives with measurable indicators, inputs, activities, outputs, outcomes, and results. Post 2017 transition should be planned. An internal participatory mid-term evaluation should be planned for 2015.

For VDAP

- Review quality and appropriateness of CSAV training. Encourage CSAV to evaluate student preparation and student-participatory program evaluations. Explore broader training/ educational opportunities, especially non-degree medium term (3-6 months) training.
- Encourage English language assessment and possible in-service remedial study for all English-medium training and/or assess English ability and hire translators where needed. Translate training materials as necessary to assure efficient learning.
- Maintain thorough and sex-disaggregated data on training and other activities.
- Explore media-based and distance learning modules to expand access to specific training modules. Videotape demonstrations.
- VDAP should draw on its global experience and credibility to advise GOI on integration of DRR agencies (earthquakes, meteorology, volcanology) and encourage better coordination with local communities and NGOs to improve awareness and preparedness.
- VDAP might research ways to strengthen Indonesian university programs, perhaps with student and/or researcher exchanges, short-courses, and collaborative research. Exploratory discussions with VDAP, CVGHM and a consortium of Pacific Northwest universities are encouraging.
- VDAP should encourage CVGHM to link volcano monitoring data with international agencies where appropriate.

For USAID/OFDA

- Maintaining records of training provided, equipment donated, success stories and demonstration of increased capacity and lives saved would tell the story of VDAP success. Reports and stories appear in scientific journals, but rarely are they found in development publications. Partner countries' journals and articles that refer to or demonstrate VDAPs role, implicitly or explicitly, should be catalogued and shared.
- Although branding can be taken to excess, and can be politically sensitive, a VDAP logo on donated equipment, or on training materials, software developed, would raise the profile of VDAP.
- Continue focus on DRR and encourage integration of VDAP with USAID/Indonesia DRR activities.
- Share with USAID/Indonesia and the US Embassy, VDAP's DRR support activities elsewhere in the world to contribute to mission-wide emergency planning and response.
- Encourage better coordination with the National Disaster Management Agency at the national and local levels and local communities and NGOs to improve awareness and preparedness.

For USGS

- Better administrative support should be given to VDAP in order to free VDAP staff for more attention to their scientific and technical work.
- Encourage the USGS (with USAID/OFDA support) to recruit additional, gender-balanced staff to enlarge the available cadre of highly trained, experienced volcanologists and technical staff qualified to respond to future volcanic crises when so requested by USAID/OFDA. This is needed not only to reduce the workloads and travel requirements for existing staff, but is also critically needed to replace existing VDAP staff as they approach retirement in coming years.
- USAID/OFDA - USGS might look to VDAP's long-term relationship with and technical assistance to Ecuador's Instituto Geofísico as an example of "handing over" project leadership.

For VDAP and CVGHM Together

- Provide increased digital storage capability at KKVO and at future regional observatories. The threefold increase of data available through the regional network is more than can be stored at KKVO. VDAP should provide guidance on installing and using this equipment.
- VDAP should encourage CVGHM to eventually replace existing analog-based seismic stations to all-digital instrumentation as opportunities arise. This is especially important for the current VDAP project to upgrade volcano-monitoring capabilities at Java volcanoes and will aid in the integration of other deformation monitoring instrumentation with seismic systems. Additional expenses will be involved initially in making this transition as new telemetry networks may be required, new digital hardware is purchased, and additional training is conducted. Such a transition should be made gradually to ease the adjustment. Although complete conversion to all-digital data acquisition and processing will require several years to implement, the completed system will be more robust, easier to maintain, more compatible with global standards, and will save money in the long run.

Recommendations Java

- More complex monitoring instrumentation should be installed – possibly to include improved deformation monitoring to improve accuracy and speed in data dissemination, thereby increasing the chances to save more lives.
- VDAP should support and training should be given to CVGHM (and/or the Geological Agency) geologists to make detailed geologic maps – with major focus on radiocarbon dating to understand long-term history of hazardous behavior.

- Any training of Indonesian observers, technicians, or volcanologists should include introductory perspectives on broader issues beyond their narrow specialties – to increase their "flexibility" and ability to understand "the bigger picture" of their responsibilities.

Recommendations Merapi

- The Merapi 'model' of broad community inclusion in early warning should be encouraged and applied at all high risk volcanoes. Strong links must be created between community groups, schools, and disaster agencies.
- VDAP should consider providing research/technical input toward designing community action plans based on local hazard characteristics.
- VDAP's style of crisis response is appropriate and should be continued.

> *"VDAP revolutionized volcano monitoring in Indonesia"*
> *- J. Sukhyar, Chief, Indonesia Geological Agency*

1. EVALUATION PURPOSE

The US Agency for International Development (USAID), Bureau for Democracy, Conflict, and Humanitarian Assistance (DCHA), Office of Foreign Disaster Assistance (USAID/OFDA) commissioned this evaluation of the joint USAID/OFDA and US Geological Survey (USGS) Volcano Disaster Assistance Program (VDAP) in Indonesia to guide VDAP programming and determine appropriate future funding levels.

In order to improve accountability and learning, the evaluation was designed to describe and explore VDAP's performance and impact, relevance (coverage and design), and efficiency, as well as sustainability and gender equity. Of special interest are the quantifiable costs and benefits of this 26-year partnership among two US Government agencies and the Government of Indonesia's (GOI) Center for Volcanology and Geological Hazard Monitoring (CVGHM). USAID/OFDA has interest in assuring the alignment of VDAP with its core mission:

> "USAID/OFDA provides humanitarian assistance to save lives, alleviate human suffering, and reduce the social and economic impact of humanitarian emergencies worldwide."

International Business & Technical Consultants, Inc. (IBTCI) was contracted by USAID/USAID/OFDA to field a team of evaluators to conduct a performance evaluation focused on what the program has achieved, how it is being implemented, how it is perceived, and outcomes and results (See Annex A for the evaluation scope of work (SOW)).

Figure 1: Conceptual framework of the VDAP program under evaluation.

Specifically, this evaluation focuses on three components of VDAP in Indonesia: a capacity building project in North Sulawesi between 2004 and 2010 to improve volcano monitoring at 10 active volcanoes; a similar program in Java at six active volcanoes which began in 2010 and is on-going; and VDAP's emergency responses to the eruptions of Merapi volcano in 2006 and 2010.

This evaluation is designed to improve VDAP programming in Indonesia and elsewhere, and to assist in determining appropriate future funding levels. It may add to the body of evaluation literature on humanitarian action and capacity building through technology transfer and scientific collaboration.

2. PROGRAM BACKGROUND

> "The Office of U.S. Foreign Disaster Assistance (USAID/OFDA) is the office within USAID responsible for facilitating and coordinating U.S. Government emergency assistance overseas. As part of USAID's Bureau for Democracy, Conflict, and Humanitarian Assistance (DCHA), USAID/OFDA provides humanitarian assistance to save lives, alleviate human suffering, and reduce the social and economic impact of humanitarian emergencies worldwide."[2]

[2] USAID USAID/OFDA website November 2012

> *"A partnership between USAID and USGS: International assistance to prevent volcanic eruptions from becoming volcanic disasters"- VDAP Chief John Pallister, PowerPoint presentation, Portland State University, Sept. 2012*

The USGS has a long history of foreign work projects, usually financed by host countries – but had never had a formal disaster response capability until after 1985, when more than 25,000 people needlessly lost their lives following a small volcanic eruption in Colombia. Recognizing the need for a rapid-response team that could respond to diplomatic requests for assistance during volcanic crises, USAID/OFDA partnered with the USGS to form a team of volcanologists able to provide volcanological expertise and monitoring equipment on short notice when international assistance is requested. This special team, VDAP, was formed in 1986 and over the past 26 years has responded to over 25 major volcanic disasters or crises in the Americas, Africa, Southeast Asia and the western Pacific. VDAP works to reduce loss of lives and economic devastation in countries experiencing a volcano emergency. At the request of host countries, and working through USAID, an experienced team of USGS volcanologists and communications experts can rapidly respond to developing volcanic crises worldwide, consistent with the USAID/OFDA mandate to save lives, alleviate human suffering and reduce the economic and social impact of humanitarian emergencies.

Figure 2: Map of Indonesia highlighting the VDAP focus areas of North Sulawesi and Sangihe Islands, and Java. Note: Merapi Volcano is on Java.

2.1. VDAP IN INDONESIA

> *"I selected the volcanoes of North Sulawesi and the Sangihe Islands for an upgrade of monitoring capabilities as a challenge for VDAP. This is the most difficult group of volcanoes to monitor in all of Indonesia, and I knew if VDAP could succeed in improving the monitoring networks there, work with other volcanoes would be easy!" Pak Surono, CVGHM Director, 8 October, 2012.*

Indonesia has the world's greatest population at risk from volcanic hazards --- 3.3 million people live on the inner flanks (within 10 km) of active volcanoes[3] and many more are at risk on the outer flanks and downstream areas. USGS has worked in Indonesia with VSI (CVGHM's original name) since the 1980s, and maintained a USGS "Resident Volcanologist" in country 1981-1983, but all prior projects were ad hoc and short-term. For the period 2004-2010, VDAP helped CVGHM to design and build a regional volcano observation network for North Sulawesi and the nearby Sangihe Island volcanoes. This project was conducted under various informal technical agreements, but fieldwork did not start until 2006 because of travel restrictions to Indonesia. A

[3] Evaluation Statement of Work. See Annex A.

formal technical agreement was signed in Fiscal Year 2008 by United States Ambassador to Indonesia, Cameron R. Hume and Indonesia's Head of the Ministry of Energy and Mineral Resources' Geological Agency, Bambang Dwiyanto. The agreement called for a staged deployment of seismic, gas and deformation networks in North Sulawesi, accompanied by assistance in improving hazard assessments. Principal project goals were completed in 2010, including installations of new seismic stations and repeaters on three hazardous Sangihe Islands volcanoes (Awu, Karangetang, and Ruang), and modernization of a Regional Volcano Observatory at Kakaskasen (KKVO). KKVO is now capable of monitoring ten volcanoes in North Sulawesi, and can conduct preliminary analysis and interpretation of seismic data from these volcanoes.

2.2. CRISIS RESPONSE AND CAPACITY BUILDING

Table 1: VDAP supported Volcanoes in Indonesia from 2004-2012.

Volcanoes in Indonesia supported by VDAP, 2004-2012	
Java	**North Sulawesi and Sangihe Islands**
Salak	Awu
Gede	Karangetang
Tangkuban parahu	Ruang
Cereme	Lokon
Slamet	Empung
Dieng Volcanic Complex	Tangkoko
Raung	Soputan
Ijen	Mahawu
Merapi	Klabat
	Ambang

The primary mission of this interagency cooperative program is to reduce eruption-caused fatalities and economic losses in Indonesia. The principal components of VDAP are: operational and partial salary funding from USAID/OFDA; partial salary funding from USGS, a small core group (ranging from about 6-10 staff members over the evaluated years) of scientists at the USGS Cascades Volcano Observatory (CVO) located in Vancouver, Washington; a large group of contributing scientists from CVO and other USGS offices; and a warehouse full of portable volcano-monitoring equipment ready for rapid deployment. VDAP crisis response includes consultations with host-country colleagues, rapid hazard assessments of the area, and activation of available remote sensing resources. Where there are no local seismic networks, the regional seismic network may be used to detect unrest while VDAP staff install a local network in collaboration with local technicians. Forecasts on volcanic hazards and risk are made using the volcano's history, instrumental monitoring to detect the movement of magma toward the surface, and the VDAP team's knowledge of volcanoes worldwide. All of this activity is conducted with the host country's volcanologists taking a prominent leadership role. VDAP remains in the background.

With more than 20 years of collaboration with CVGHM, and more volcanic activity than anywhere else on earth, VDAP scientists are routinely called for analysis assistance during many potentially destructive volcanic episodes in Indonesia. Since Merapi is one of the world's most hazardous volcanoes, because of its proximity to densely populated areas (i.e., PP1), VDAP has a long history of very successful collaborations in capacity building and technical improvements to Indonesian volcanology – as well as a very deep-rooted trust and personal friendship with staff and directors. As pressure to analyze unrest and make life-saving decisions increases, Surono, the Director of CVGHM, frequently described how John Pallister (Chief of VDAP) and other VDAP/USGS personnel are his main contacts whenever the stresses of his job become overwhelming, whenever questions regarding a crisis are overly pressing, and whenever he needs a sympathetic ear to discuss important issues. This kind of personal relationship has provided a deep trust and friendship that both men hope will develop into the realization of a dream – the creation of Earth Observatory – Indonesia.

Since 2006, and more so in 2010, VDAP delivered near-real time analyses of changes at Merapi volcano's summit which, in 2010, was directly shared with local response teams. This access to fast satellite information allowed Indonesian teams to assess the magnitude of an eruption and determine which areas are most at risk. In 2010, this crucial information was shared with disaster teams on the ground and used to inform decisions regarding the extent of evacuations needed. VDAP teams also provide technical equipment and assistance to

replace systems destroyed, to ensure increasing local independence in volcanic monitoring, and access to world-wide advances in volcanology and its adaptation to Indonesian contexts. See Annex D for a history of volcanic eruptions in Indonesia and VDAP's assistance.

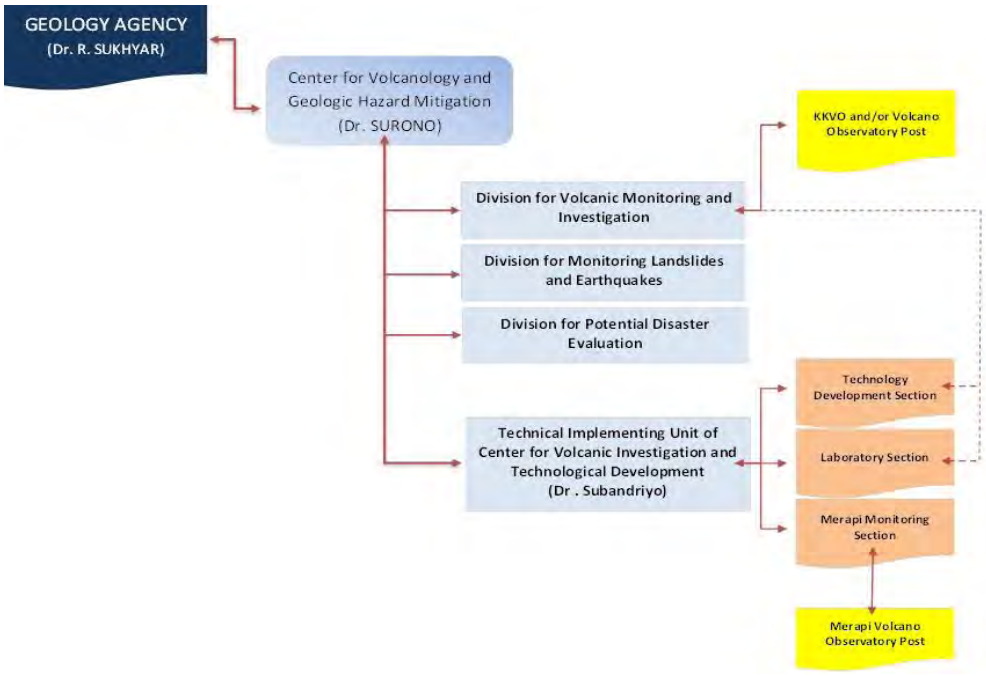


Figure 3: Organizational chart of relationships between geological hazard agencies mentioned in this report.

Since it is much "better to prepare than repair" (www.usgs.gov), when not involved in a crisis, VDAP focuses on capacity building through its own technique of learn by doing – providing monitoring equipment and the education needed directly to Indonesian technicians and observers to ensure they are able to install, use, repair, replace, and rebuild, as a means of better understanding hazards, monitoring, and crisis response.

2.3. Partner Organizations and Structure

Within the GOI's, Ministry of Energy and Mineral Resources, CVGHM is one of the centers of the Geology Agency (GA). Two of the major functions of CVGHM are research and monitoring volcanoes all over the country. The Center for Volcanic Investigation and Technological Development (BPPTK) is a technical implementing unit of the CVGHM based in Yogyakarta. It has three technical units that are responsible respectively to monitor Merapi volcano including relevant Mt. Merapi research, technology development, and a chemical laboratory. The latter two units are national in scope. While CVGHM is responsible for *directing* the development of technology, the actual development is carried out at BPPTK.

CVGHM (BPPTK in the case of Merapi, in coordination with CVGHM) communicates and provides volcanic hazard information to the national (BNPB) and local disaster risk reduction agencies (BPBD) and local governments (provincial, regency/city level) on volcanic activities. (See Figure 3 above.)

2.4 VDAP Funding

VDAP is a joint program of the US Department of the Interior, which houses USGS, and USAID/OFDA. Shared funding provides salaries for approximately six full time equivalent VDAP personnel stationed primarily at the CVO, equipment, training, and travel. USGS and USAID/OFDA share costs, and the average annual overall total worldwide costs over the past seven years is US$1,250,000.

Table 2 - VDAP Funding, 2006 - 2012

FY-2006 categories	FY-2006	FY-2007	FY-2008	FY-2009	FY-2010 categories	FY-2010	FY-2011	FY-2012
USGS salary support	$434,640	$482,950	$507,097	$629,624	USGS salary support	$780,904	$796,272	$803,960
OFDA salary support	$434,640	$482,950	$507,097	$603,799	OFDA salary support	$718,262	$887,894	$942,770
Emer. fund & cache	$93,600	$110,00	$300,000	$250,000	Emer. fund & cache	$225,000	$275,000	$260,000
Asia/Pacific IS	$101,572	$115,000	$50,000	$145,000	Asia/Pacific IS & TA	$145,000	$391,000	$850,000
Africa IS	$0	$0	$0	$10,000	Africa IS & TA	$70,000	$20,000	$10,000
S.Am. (Chile)	$0	$0	$0	$0	LAC IS & TA	$90,000	$106,000	$255,000
LAC IS	$40,000	$46,000	$35,000	$0	-	-	-	
LAC Continuity	$20,000	$30,000	$70,000	$50,000	-	-	-	-
Database	$0	$25,000	$45,000	$25,000	Database & RS	$40,000	$40,000	$35,000
Training	$63,400	$55,000	$60,000	$125,000	-	$70,000	$90,000	$107,230
					Geosci. Advisor OE*	$25,000	$25,000	$25,000
Total OE	$318,572	$381,000	$560,000	$605,000		$665,000	$947,000	$1,542,230
Total OFDA funding	$753,212	$863,950	$1,067,097	$1,208,799	Total OFDA funding	$1,383,262	$1,834,894	$2,485,000

Note: Figure provided by USAID/OFDA VDAP

Note: Change of categories in FY 2010

Note: the costs of the Indonesian program are not isolated, but may be as high as half of the overall program

Note: IS=Infrastructure. TA=Technical Assistance

VDAP has provided the following breakdown of Indonesia-specific USAID/OFDA program costs, excluding salary[4]:

Fiscal Year	USAID/OFDA USD $	Primary activities
2004	27,000	Site visits by USGS and CVGHM, Awu Equipment
2005	10,000	Site visits to U.S. by CVGHM
2006	106,500	Initial shipment of KKVO equipment. Merapi Crisis response
2007	97,000	Equipment for Gamkonara and Kelut, initial installs at KKVO & N. Sulawesi
2008	95,600	Multiple equipment shipments to KKVO, Flores project, N. Sulawesi travel

[4] According to VDAP, these figures are likely low, but may be illustrative of the low US tax-payer cost of Disaster Risk Reduction and emergency preparedness spending, in contrast with disaster response.

Fiscal Year	USAID/OFDA USD $	Primary activities
2009	127,600	KKVO equipment, N. Sulawesi travel
2010	132,000	Merapi crisis response, Ijen/Raung equipment, E. Java travel
2011	170,000	Continued Merapi crisis equipment, E. Java travel
2012	156,500	E. Java seismic, Bandung workshop, Agung GPS and travel. Dieng travel, Geology workshop in U.S.
2013	12,500	Raung crisis response

Note: Costs for 2013 represent the first quarter of Fiscal Year 2013 (September – December 2012)

2.5. OTHER DONORS

Balancing international interests and Indonesian needs, CVGHM over the past decades has entered into cooperative agreements with a number of governments and research agencies. The European partners are mainly "research partners." They provide equipment in support of their research projects, but repatriate most of the equipment upon completion of their studies. Some (France) support graduate studies for Indonesian students. Only VDAP, Japan, Singapore (through the Earth Observatory of Singapore (EOS)) and Australia donate equipment and focus on building monitoring capacity. CVGHM has divided the country into areas of special interest and asked donor/partner countries to take on monitoring support for a specific area and specific volcanoes. Thus the US is assigned to six volcanoes in Java.

"VDAP stands out from the others because of their consistency, their true partnership and their training and capacity building. Their donated equipment is useful to Indonesia and not removed, like other donors." – CVGHM Director Surono

The Bandung Accord: Asia Regional action

The framework for VDAP past, present and future focus in Disaster Risk Reduction (DRR) is based on the Bandung Accord. CVGHM hosted the 2008 Asian International Symposium on Modelling of Volcanic Eruption for Volcanic Hazard Assessment in Bandung. Participants included representatives from volcano hazards agencies and universities in Indonesia, Japan, Papua New Guinea, Philippines, France, Belgium, Italy, Germany, New Zealand, Singapore, and the United States. Plans were discussed for ongoing and new collaborations between CVGHM and the countries listed above, and for multi-lateral coordination. Participants proposed the following actions to reduce risk:

- Pacific Rim nations will enhance monitoring of volcanoes in their territories through setting priorities for new monitoring networks, hazard assessment and communication, database development and research on volcanic processes.
- Priorities will be based on national and regional analyses of volcanic risk. For example, for each volcano, analyses will include 1) threat levels, 2) current monitoring capabilities and knowledge base, and 3) improvements required to fill gaps between current status and optimal levels needed to save lives and property.
- Participating nations will coordinate projects to build capacity, to provide opportunities for exchange of knowledge and experience, and to seek common approaches and methods for risk reduction.

John Pallister, VDAP Chief, reports regular collaboration and coordination of activities with the EOS and, Jean-Phillie Metaxian, who works at CVGHM and leads the French IRD (L'Institut de Recherche pour le developpement) program in natural hazard mitigation which is planning joint work in Maluku as well as Merapi.

According to Dr. Pallister, "in its own way, the Merapi response was a realization of the Bandung Accord at least to the degree that the Indonesian government elected to bring together workers from the US, France, Japan and Singapore." The French advisor also pointed out that he regards this cooperation as an outcome of the "Bandung Accord." The International Merapi response also led to the collaboration of Surono, Philippe

Jousset (a respected French researcher in volcano-geophysics) and John Pallister as the guest editors for the upcoming issues of JVGR on the 2010 eruption.

In addition to the US VDAP program, the following countries and agencies are providing support to the GOI:

Australia: Focuses on disaster risk reduction, particularly earthquakes, and improving community emergency response. In order to standardize more of the volcanic monitoring equipment and software used by CVGHM, the Australian Bureau of Meteorology (BOM) and VDAP reached an agreement with CVGHM to provide seismic monitoring equipment (at cost) to the BOM for donation to CVGHM. Australia is working with CVGHM on the island of Flores, and VDAP equipment is installed (by CVGHM scientists trained by VDAP) on volcanoes on Flores. Two CVGHM scientists from the Flores project have been trained in EARTHWORM software. Additionally, VDAP repaired damaged circuit boards and returned them to CVGHM for Flores.

France: Has supported tertiary education in France and has funded senior scientists at CVGHM to complete doctoral studies in France. A French researcher is embedded at CVGHM and French research teams travel to Indonesia for short-term collaborative projects. A French research team studying tectonic movement at Lokon in North Sulawesi worked with KKVO staff.

Germany: Germany is no longer a CVGHM partner, but the Georisks Project, based at the Geological Agency works on improving tsunami warning through the German-Indonesian Tsunami Early Warning System (based in Jakarta). The technical equipment they provided could not be sustained by CVGHM.

Italy: Designated as the CVGHM partner for Sumatra, but is not yet active, to the knowledge of this team.

Japan: Provides turn-key equipment and instrumentation and some staff training on the equipment, and two study opportunities each year in Japan.

Belgium: Individual Belgian volcanologists have been involved in research, especially at Merapi.

The World Bank Global Facility for Disaster Reduction and Recovery (GFDRR): Developed by Indonesia and Australia, together with the GFDRR, InaSAFE is an open-source disaster impact-modeling tool developed in partnership by BNPB, the Australia-Indonesia Facility for Disaster Reduction (AIFDR), Global Facility for Disaster Reduction and Recovery (GFDRR), and the World Bank's East Asia and Pacific Disaster Risk Management team through the AusAID-East Asia and Pacific (EAP) Infrastructure for Growth Trust Fund.

Australia–Indonesia Facility for Disaster Reduction (AIFDR): The Australia–Indonesia Facility for Disaster Reduction is a joint Australia-Indonesia initiative that uses science and research to identify areas most at risk of natural disaster to reduce the impact of these disasters by giving people information about how to build safer houses and public buildings. Dr. Pallister met with this team in Jakarta and Bandung as they are working with CVGHM to assist in ash cloud modeling. As a result of this collaboration AIFDR agreed to use a computer model developed by CVO to avoid running competing computer codes.

AIFDR is also shaping training and planning for disaster managers through partnerships with APEC, ASEAN and the United Nations and providing support to Indonesia's stand-by Disaster Rapid Response and Assistance Force to deploy into disaster areas within hours of a disaster.

Figure 4: 2012: CVGHM's foreign partnerships – U.S. and Japan are now the major partners for volcano monitoring (Other countries provide mainly research partnerships)

3. EVALUATION METHODS AND LIMITATIONS

3.1. PROGRAM LOGIC

According to USAID/OFDA,

> "The purpose of this project is to provide technical assistance to national volcano monitoring organizations to minimize the damage resulting from major volcanic events. VDAP contributes to the risk reduction and response capacity in developing countries through donating volcano monitoring equipment to local volcano observatory staff to track changes at volcanoes, developing early warning plans and monitoring technology, and providing hazard assessment training."

The underlying program logic, and theory of change[5] of VDAP is that better trained and informed scientists using improved methods and technologies will provide accurate and complete information to decision-makers enabling them to reduce the number and severity of volcanic crises, thereby saving resources and lives. USAID/OFDA's Geoscience Advisor Gari Mayberry states the goal as: "to prevent volcanic crises from becoming disasters." One of the main challenges for volcanologists around the world is to continually refine forecasts so that people can live and work around volcanoes with a minimum of disturbance and yet be evacuated when hazard is temporarily, unacceptably high.

[5] The USAID/OFDA/USGS/VDAP cooperation is based on a series of Interagency Agreements, PASAs, PAPAs. There is no Program Logical Framework, Results Framework or Program Monitoring Plan. Therefore, a theory of change and assumptions is stated for this evaluation.

3.2. APPROACH TO THE EVALUATION

Based on the nineteen key questions included in the SOW, this external, performance evaluation employed a mix of qualitative methods and, where possible, quantitative methods to address the over-arching questions[6]:

-What did VDAP do well?

-What could they have done better?

-What should they do in the future?

The evaluation questions guide the results reporting in five main areas: overall performance and impact, efficiency, coverage and design, sustainability, and gender equality and equity. These questions apply to the four main focal areas of VDAP activities: equipment provision, early warning planning, training in the use and analysis of volcano hazard mitigation, and the cross-cutting issues of gender equity. Additionally, the evaluation team explored the role of VDAP in Science Diplomacy.

This evaluation was designed to focus on the Indonesia part of the USAID/OFDA/VDAP partnership only, and within that, is limited by both the time frame (2004-present) and the three specific focal areas: capacity building (CB) in North Sulawesi and Java, and crisis response (CR) at Merapi 2006 and 2010. Essentially, this report is three evaluations in one. The evaluation questions were applied, as relevant and feasible across the three focal areas. Thus, the Findings section (Section 4) of this report is structured to:

a) report overall findings relevant to all areas,

b) answer the key questions for each of the three geographic and topical areas (CB in North Sulawesi, CB in Java and CR at Merapi) and

c) include additional findings common to all three areas: (e.g. Training, Equipment, Gender, VDAP GOI relations, Value of DRR and lives saved, and Science Diplomacy).

3.3. WORK PLAN

IBTCI and the evaluation team, in collaboration with the evaluation Contracting Officer's Representative (COR), developed an evaluation work plan, for the period of September–December 2012. The initial work plan in the IBTCI proposal was revised and the final work plan is reflected in the Inception Report and in Annex J of this report. Work began in September 2012, with a literature review and reading-in period, followed by travel to Washington DC and IBTCI and USAID/OFDA headquarters by the three principal evaluators. The initial kick-off meeting at USAID included representatives from USGS, USAID/OFDA, IBTCI and the USAID contracting office. Based on recommendations from VDAP and with concurrence from USAID/OFDA, the team then traveled to Vancouver, Washington and was briefed at CVO by VDAP staff, and joined five senior Indonesian CVGHM staff in a field visit to Mt. St. Helens and observed VDAP training in action.

Traveling to Indonesia, the team began its research in Jakarta, meeting first with the USAID/OFDA Regional Advisor and USAID officers, GOI Officials and other donors at their headquarters. Three Indonesian researchers joined the team and traveled overland to Bandung and the CVGHM headquarters. Based in Bandung, the team toured the CVGHM facilities, and met in groups and individually with staff and representatives of other donors. The team undertook a joint visit to the Tangkuban Prahu Volcano Observatory and developed a case study (see Annex L).

Accompanied by CVGHM Sub-division Director Hendra Gunawan, the team proceeded overland, visiting two volcanoes supported by other donors (France, Japan) for comparison, and three other volcano observatories en route to Yogyakarta, where the focus shifted to Merapi crisis response and the role of VDAP, BPPTK and community groups.

Flying to North Sulawesi, the team stayed in Tomohon, near KKVO, and divided up to visit four peninsular and one island volcano within the network. (The team leader was called away during some of this time by a

[6] See Annex I: Data collection tools for more detail

death in her family). Sub-division Director Kristianto and several technicians joined the team at KKVO. The team prepared its initial analysis and debriefing and returned to Jakarta to present the preliminary findings to USAID/OFDA before returning to Washington DC for a final debriefing at USAID/OFDA. (See Annex F for a complete listing of evaluation activities.)

3.4. PERSONNEL

IBTCI fielded a team consisting of a senior social scientist and Indonesia specialist resident in Yogyakarta, a senior Volcanologist who previously worked at Merapi Observatory and other Indonesian volcanoes, and an evaluation specialist with experience working for USAID/OFDA and the Government of Indonesia. Each of the three took the lead in review of one of the focus areas: North Sulawesi, Java, and Merapi. Indonesian researchers joined them, bringing with them expertise in DRR, evaluation methodology, community-based volcano monitoring groups, gender analysis, NGOs and English translation.

3.5. TOOLS AND TECHNIQUES

As described above, a matrix of key questions was designed based on the SOW main questions, IBTCI interpretation of these questions, and team expertise in field work (see Annex B) that addressed the major issues in the five evaluation focus areas: overall performance (effectiveness) and impact, efficiency, coverage and design (relevance), sustainability, and gender equity. The matrix presents the methods of collecting data, defining sources, and examples of interview questions addressing key points in each of the focus areas. Basically, the method specifies what kind of information is to be gathered, from whom, and through what method. Data collection primarily used the following methods:

- **Review of more than 100 project documents** from USAID/OFDA, VDAP, CVGHM, USGS, other stakeholders, and a broad use of internet sources world-wide (see Annex G for the bibliography).
- **Stakeholder analysis:** determination of key informants and stakeholders, and plan to gather information from them. (see Figure 5 below)
- **12 Group discussions** soliciting comments and responses around key issues related to partnerships between CVGHM and VDAP, capacity building, equipment and services provided priorities, and challenges.
- **Perception/attitude Survey questionnaire** designed, tested and administered to 31 CVGHM employees who participated in VDAP training.
- **Key informant interviews** with 9 major players.
- **Semi-structured group interviews** focusing on strengths, weaknesses, opportunities and challenges; and then ranking the most critical issues.
- **Field site visits and direct observation** at 14 volcano observation posts in Java and North Sulawesi in order to better understand the observation post operations and the impact of capacity building trainings provided locally and externally.
- **Meetings and interviews** with 83 people representing a wide range of stakeholders, other donors, beneficiaries and those living within red zones of active volcanoes.
- **Timeline/progression** highlighting key external or internal events that impacted program performance.
- **Case studies** and **success stories** focusing on individuals and groups to illuminate and illustrate direct and indirect VDAP program impacts.

In order to determine priorities and coverage the team reviewed the range of stakeholders and considered their relationship to VDAP.

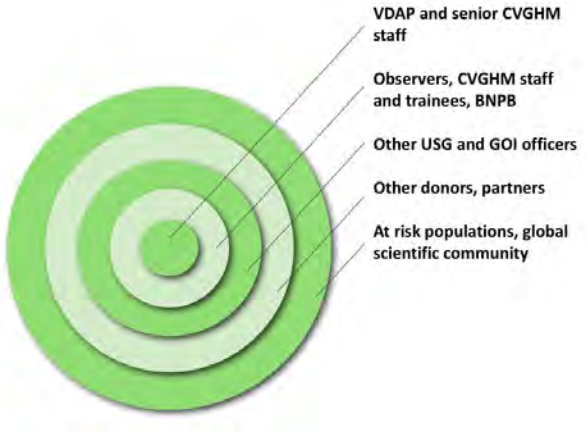


Figure 5: Stakeholders

Corresponding tools were developed and used that include structured questionnaires containing question guides for focus group discussions and Strengths, Weaknesses, Opportunities, and Challenges (SWOC) exercises (focused group analysis of experiences in a project based on defining its strengths, weaknesses, opportunities and challenges) with CVGHM scientists, technicians and BPPTK Yogyakarta staff. Included also are questionnaires for CVO, USAID/OFDA and other donors. Some tools such as a training survey questionnaire outline for case studies, and questionnaires outlining specific questions to resource persons were developed along the way. (See Annex K.)

3.6. Data Analysis

Results from group and individual interviews (See Annex C for the list of persons interviewed) were recorded in the evaluators' notebooks and shared using the common Drop Box software tool. Team members compared notes and discussed issues in the evenings. Team members became specialized in aspects of the research and took on lead authors roles, collating information and data from other team members.

The VDAP Work Plan for 2004-2010, with specific target and projected dates, was a useful tool to compare with the CVGHM report of activities over the same time period. Comparison of equipment lists shipped and received and installed provided important data. The perceptions/attitude survey offered a qualitative indicator of perceptions regarding gender and the value of training. Overall and specific findings, conclusions and recommendations were developed in a fully participatory manner.

3.7. Limitations

This evaluation was commissioned to focus on only Indonesia over a limited time period (2004-present) and three activities (North Sulawesi, Java, crisis response in Merapi) all of which are part of a long-term, global partnership between USAID/OFDA, USGS and GOI. The IBTCI evaluation team met in Washington DC with only a few days to get acquainted and cooperate to develop a work plan and inception report while the three Indonesian team members were being hired. The full team assembled in Jakarta and traveled overland to Bandung and Yogyakarta, then flew to Sulawesi. Constraints included timing as several key informants were away, distances traveled were great, a team of six was cumbersome, and administrative logistics were complex.

Very little about this program conforms to either a "standard" USAID-funded development program, or a "standard" USAID/OFDA-funded humanitarian assistance program, although VDAP has elements of each. Capacity building is intrinsic and central to all development programming, along with an assumption of eventual disengagement, and program completion. VDAP's rapid response capacity to deploy in an emergency anywhere in the world is a good fit with USAID/OFDA's mission and modus operandi.

As VDAP has developed its capacity building partnership with Indonesia, it was grown organically beyond the mold of emergency response and refocused on regional capacity building and DRR cooperation. Therefore VDAP's Indonesia program originally gathered no baseline data, and had no strategic plan, no formal project document, no logical framework, no program monitoring plan, no established indicators (until 2012) available to external evaluators to base their review. Despite the absence of these now-common practices, VDAP has provided regular, comprehensive, detailed reporting on the Indonesia program together with global activities. Indonesia's portion of training, equipment, cache, salary, and budget is not disaggregated or readily available.

Evaluation of humanitarian assistance is a new and developing science and this team's study of the Merapi eruption response pulled us toward broader analysis of the overall emergency response and DRR program. However, we were constrained to identify VDAP's specific role (information source) and credible attribution to VDAP for saving lives and livelihoods. (See discussion 4.4.6 Quantifying Findings)

Increased capacity is evident in changes in institutional resilience, stature, adroitness and vigor, individual's skills, knowledge and attitudes, and overall functioning. Training and equipment donation are VDAP's most important tools in capacity building. However, the majority of the training is one–on-one teamwork, joint projects and collaborative work, linked to mentoring relationships and regular personal follow-up and support. This type of training doesn't lend itself to standard indicators such as number of contact hours, or curriculum analysis or pre- and post-training evaluation. Numbers and gender of trainees have not been tracked and reported.

4. FINDINGS

Findings: North Sulawesi:

- The North Sulawesi regional network improves the GOI ability to forecast eruptions, and mitigate the impact of volcanic crises.
- CVGHM is now planning 12 regional networks across the country, following the North Sulawesi model.
- CVGHM requested VDAP focus on North Sulawesi and Sangihe Archipelago for a capacity building program and to pilot new regional approach to volcano monitoring.
- With VDAP assistance, the KKVO regional Observatory links ten active and sub-optimally monitored volcanoes to the KKVO hub and CVGHM in Bandung.
- Data storage capacity at KKVO is "inadequate" for the expanded network.

4.1. CAPACITY BUILDING IN NORTH SULAWESI

Before 2004, the extant monitoring system in North Sulawesi consisted of seven observatories, one on each of seven hazardous volcanoes. According to Pak Kristianto, Sub-division chief at CVGHM, each observatory was like those throughout Indonesia: housed in a solid concrete house, most of which were built in 1985, with rooms for equipment, cache, kitchen, toilet, living area and bedrooms.

A team of three observers, usually from the local community manned each observatory, each responsible for an eight-hour shift during which they maintained direct observation of the volcano, and attended to the single seismograph (typically a PS2) recording radio signals from a single buried seismometer on the volcano. They were responsible for equipment upkeep, maintenance and minor repairs, and data storage. The seismograph recorded volcanic earthquakes, which the observers measured and reported to Bandung CVGHM using a single band radio, twice daily, usually responding to the question, "How many tremors or other volcanic activities did you have today?"

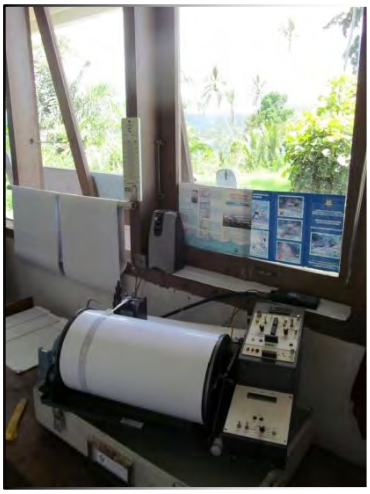


Figure 6: Soputan Volcano Observatory. This standard PS2 seismograph is linked to two seismometers: one sends data to KKVO regional center, and one sends data directly to CVGHM Bandung

Awu volcano, at the northern end of the Sangihe arc is one of the most dangerous volcanoes in Indonesia, and has killed about 8,000 people in the past 300 years. Following the eruption of Awu in 2004, when more than 15,000 people were evacuated, CVGHM requested VDAP to focus on North Sulawesi and the Sangihe Archipelago for a capacity building program and to pilot a new regional approach to volcano monitoring.

In 2007, Karangetang Volcano experienced repeated eruptions, putting 40,000 persons in the vicinity at risk. VDAP provided telemetry and seismic equipment at KKVO and remote sensing data to CVGHM. Approximately 500 people were evacuated and lives were saved, in part due to VDAP assistance.

A listing of the 10 volcanoes in the regional network is on page 3 of this report. Specific information of the 10 volcanoes and VDAP activity is included in Annex D.

Today, The KKVO regional Observatory links ten active and sub-optimally monitored volcanoes to the KKVO hub and CVGHM in Bandung. VDAP added eight new seismic stations to the existing seven, as well as to training and storage facilities. VDAP and CVGHM upgraded monitoring of all ten active volcanoes. They installed a completely new volcano monitoring base station, including hard- and software for data acquisition, telemetry, data processing and Internet communication at the (renovated) KKVO. They installed 13 new seismic field stations and two radio repeaters for the North Sulawesi peninsula.

4.1.1 OVERALL PERFORMANCE

CVGHM works with VDAP and other foreign governments to upgrade its volcano monitoring technology and to improve its volcano hazards program. CVGHM is also transitioning from a centralized base of technical expertise in Bandung to developing a series of regional centers with such expertise, starting with KKVO.

KKVO was collocated with the Lokon and Mahawu observatories in Tomohon, North Sulawesi, near Lokon-Empung Volcanoes. The KKVO is Indonesia's first of 12 planned regional networks, linking 10 active and sub-optimally monitored volcanoes to the KKVO hub and CVGHM in Bandung. Today, this North Sulawesi Regional Center is a model for the rest of Indonesia. Now approximately three times more monitoring data are gathered by VDAP-supplied improved equipment, expanded radio networks and VDAP-trained technicians. The graphic below illustrates the regional network, showing observatories, repeater stations, and networked radio telemetry.

VDAP equipment is now the standard for CVGHM as it transitions from a centralized base of technical expertise in Bandung to developing a series of 12 regional centers. In the future, most of this equipment will be constructed locally and installed nationwide.

Resulting from VDAP's support with equipment and training, KKVO and CVGHM-Bandung work together to improve forecasting and response. During the eruptions of Karangetang in 2007, before VDAP was able to travel to North Sulawesi, VDAP provided seismic and telemetric equipment to CVGHM and remote sensing information that improved the ability of officials to decide to evacuate 500 people, perhaps saving their lives. VDAP-trained technicians have installed similar equipment at other volcanoes (Flores), thus spreading the impact of VDAP support beyond North Sulawesi.

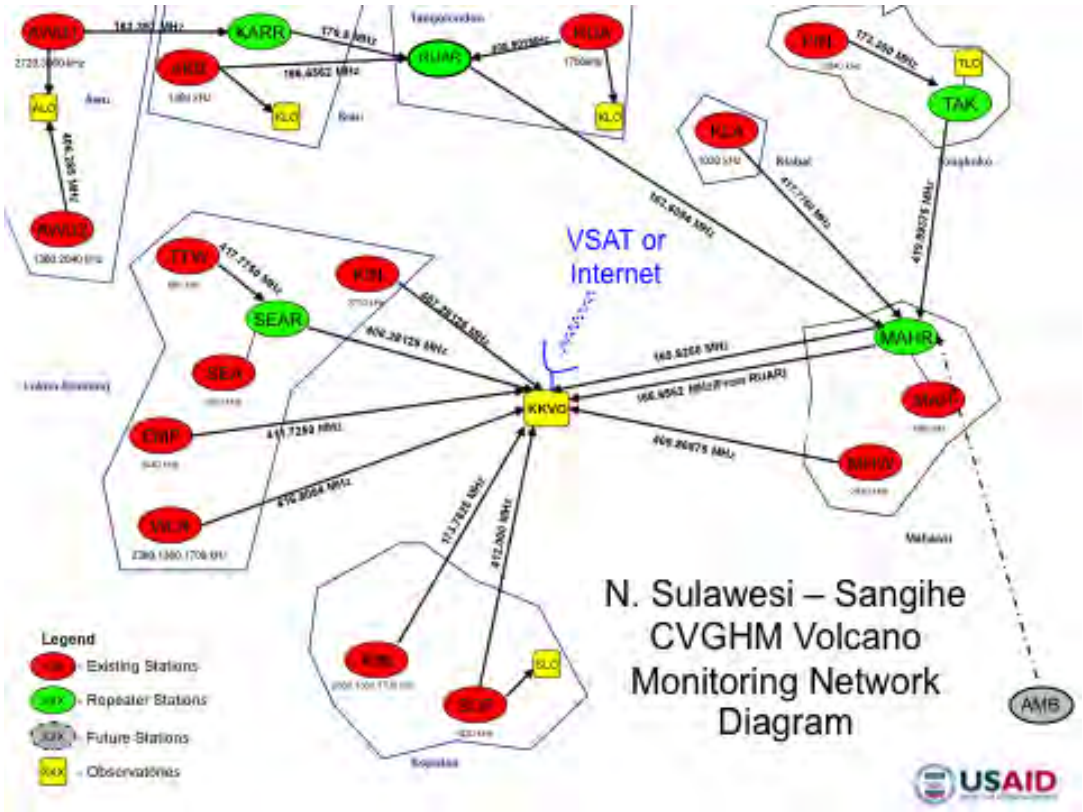


Figure 7: North Sulawesi - CVGHM Volcano Monitoring.

4.1.2. COVERAGE AND DESIGN

As mentioned above, following the 2004 of the Awu volcano, CVGHM requested VDAP to focus on North Sulawesi and the Sangihe Archipelago for a capacity building program and to pilot a new regional approach to volcano monitoring. VDAP scientists Dr. Christopher Newhall and Dr. John Pallister worked with Dr. Mas Atje, CVGHM Science Advisor to draft a cooperative program under an existing agreement which was negotiated for the GOI by the State Ministry for Research and Technology and the US by the Department of State Office of Science and Technology Cooperation.

Figure 8: CVGHM Geoscientist Anna M. repairing radio receiver on Karangetang, part of North Sulawsei network.

The Goals of the CVGHM/VDAP cooperation in North Sulawesi were:

- "To further develop the Regional Volcano Monitoring Center of North Sulawesi, located at KKVO, with existing observatory and upgrading of volcano monitoring system in North Sulawesi, including seismic stations and telemetry, geodetic, SO2 emission monitoring, equipment cache and data management and,
- To conduct geological evaluations of other volcanoes as agreed upon,
- To provide training for the Indonesian staff dealing with NS volcano monitoring, and

- To provide internet communication for seismic and related monitoring data telemetry."[7]

Figure 9: KKVO Observer Ferry with new well-equipped workshop for network maintenance and repairs.

To achieve these goals, VDAP and CVGHM upgraded monitoring of all 10 active volcanoes. They installed a completely new volcano monitoring base station, including hard- and software for data acquisition, telemetry, data processing and Internet communication at the (renovated) KKVO. They installed 13 new seismic field stations and two radio repeaters for the North Sulawesi peninsula. The joint VDAP-CVGHM teams improved data processing, installed EARTHWORM data collation software, improved telemetry from volcano-specific data collection points, introduced global positioning geodetic monitoring and provided Internet technology assistance for data communication and access to remote sensing data. With each new installation, VDAP provided on-site training for CVGHM staff in technical capabilities and operation, and maintenance of new instrumentation and software. They further agreed to widen coordination with other related institutions, support other logistical needs and observatory improvements and on-going scientific and technical collaboration.

VDAP added eight new seismic stations to the existing seven stations (more than doubling the monitoring capacity). Global Positioning Systems (GPS) were installed at Lokon and KKVO. Geological studies and hazard mapping were undertaken at Lokon, and Internet options were tested for KKVO. The following formal workshops were held during this time period:

- Volcanic remote sensing in Bandung
- Seismic equipment, EARTHWORM software, and interpretation of seismic data workshop in Bandung
- Training on next generation analog seismic telemetry (Mc8, 12 v base and Radios) and construction at CVO, Vancouver, WA
- Training on Volcano monitoring and Hazard assessment at CVO
- Mini-DOAS (FLYSPEC) training and survey at Karangetang.

Infrastructure improvement included a new workshop and upgrade at KKVO. All of the volcanic monitoring equipment and related installation hardware, computers, radios, tools and manuals used in the KKVO and field installations were left at KKVO as a donation from USAID/OFDA to the GOI.

VDAP achieved or exceeded its goals for this project despite implementation being delayed until 2006 due to travel restrictions caused by civil unrest. As additional needs were identified, VDAP demonstrated the flexibility and agility to respond and adjust. Most of the capacity building activities occurred in 2009 and 2010. Although the program is completed, VDAP remains involved in North Sulawesi as needed in crisis response and for on-going training support with staff at KKVO.

[7] MOU D2006

4.1.3. EFFICIENCY

In response to the CVGHM request to VDAP to establish the regional network, USAID/OFDA increased funding to provide additional equipment to more than double the seismic stations, fund annual travel for installation and training workshops, and increase staff time. Trips were planned to deliver and install equipment jointly with CVGHM staff and conduct multiple trainings. Benefits include a model of regional networking to improve the quality and quantity of real time data, and increased physical and human capacity. According to Dr. Chris Newhall, former VDAP scientist and author, "Costs and Benefits of Volcano Monitoring: Mt. Pinatubo", and current Director, Earth Observatory Singapore:

> "In evaluating the cost and impact of VDAP in Indonesia, you have to think very long term-not focus on short-term benefits, Most of the fruits of VDAP work-whether saving lives, dollars or changing the course of Indonesian volcanology, will become apparent over decades to come, as Indonesians use their new knowledge and monitoring capabilities to save life and property during future major eruptions we cannot anticipate at present."[8]

"The digital data [at KKVO] can now be looked at by anyone. Digital data allows less travel and more interaction among those responsible for the data (i.e. technicians, seismologists and supervisors). Don't know how you quantify that, but it's a huge change - like having one copy of Mark Twain's Huckleberry Finn in a library in North Dakota that only a few people can read, to providing a digital copy that can be read from (almost) anywhere by anyone."- Wendy McCausland – VDAP Team, CVO

4.1.4. SUSTAINABILITY, NORTH SULAWESI

Training: Most of the training is customized one-on-one training between VDAP staff from CVO and Indonesian staff. During the annual work plan exercise, CVGHM and VDAP decide on priority training topics and timing for structured workshops. VDAP staff accompanies delivery of new equipment and oversees or observes installation of the equipment together with Indonesian colleagues. Resulting from the annual workshops and training sessions, CVGHM scientists and technicians have demonstrated their willingness and ability to utilize new skills and pass along training to colleagues. The evaluation team survey of trainees found that 92% of respondents strongly agreed or agreed with the statement: "I have shared knowledge and skills from the VDAP training with my colleagues."

Equipment: Most of the equipment sent by VDAP to Indonesia from 2004-2010 was directed to infrastructure building at KKVO. Discussion of the efficiency of shipping US-made equipment is elsewhere in this report (4.4.2. Other Findings: Equipment). Although some of the equipment sent is specially designed for Indonesia, and final assembly is done in Indonesia, some off-the-shelf items like solar panels are shipped from the US although they could be procured locally. Much of the equipment is shipped via the diplomatic pouch, which is efficient in terms of cost and speed, but not sustainable.

CVGHM and KKVO staff told the evaluation team that data storage capacity at KKVO is inadequate for the expanded network. Limited bandwidth and fragile Internet connectivity also reduce realization of the full potential.

Institutional: VDAP is committed to joint work to improve the assessment of volcanic hazards and eruption forecasting and publication of results. Publication in international journals is important to CVGHM scientists to increase their credibility among the worlds' volcanologists, and to contribute their knowledge and perspective to a variety of international hazard mitigation programs.

There is ample evidence that CVGHM's VDAP-enhanced standard operating procedures (see Early Warning Protocol in Table 3 of 4.4.4 Risk Mitigation Partnerships) for pre-eruption crisis management and eruption

[8] Interview, Jakarta, October 2, 2012

response are working well. An example is the 2011 eruptions of Lokon and Soputan during which direct observation of volcanic eruption and proper reporting protocols were followed. Appropriate and rapid responses resulted in an informed decision NOT to evacuate unnecessarily or prematurely saving money and possibly lives, as each evacuation has costs, especially to at-risk populations. As an example of successful KKVO sustained capacity, while the evaluation team was visiting, alert observers at KKVO received data on a new eruption on Lokon, conferred with CVGHM, informed local disaster management and civil aviation authorities, and avoided unnecessary risk, evacuation or panic.

Example: Sustained capacity and on-going crisis response partnership post 2010

In June 2011, Soputan volcano began experiencing seismic unrest. The Alert was raised to Level 3 (out of 4) and on 2 July a 6-km radius prohibited zone was established by CVGHM. On 3 July, an eruption took place, which produced an ash plume to 20,000 ft. altitude and pyroclastic flows extended 3 to 4 km west from the summit. In support of the CVGHM response, the VDAP team provided satellite data and assistance in interpretation of the seismicity. This allowed CVGHM to conclude that villages on the southwest flank of Soputan did not need to be evacuated. Pyroclastic flows in July, 2011 extended almost five kilometers from the summit towards these villages, but stopped short. The CVGHM forecasts proved correct and the expense and disruptions of needless evacuations were avoided.

Soputan is a site where VDAP has assisted CVGHM in installing new seismic monitoring sites and where they have collaborated in the preparation of a new hazard assessment. The eruption was similar to, but smaller than, those in the past five years and as expected, new canyons that were cut in the crater rim during the 2007 and 2008 channeled the pyroclastic flows mainly to the west away from the main touristic area of the National Park and toward an area frequented by rock miners. (Note, local authorities were contacted and they drove to the mining area and alerted the miners.)

No fatalities were reported, although the ash plume from the eruption closed the international airport in Manado for a day and caused delays, cancellations and rerouting of regional air. (VDAP Quarterly Report 4, FY2011)

4.2. CAPACITY BUILDING AT CVGHM AND JAVA PROGRAM

Findings: Java

- The original program to monitor eight volcanoes has been reduced to six: Tangkuban Perahu, Ciremai, Slamet, Dieng, Raung, and Ijen.
- Selected volcanoes have better access to roads, power, and communications infrastructure than did North Sulawesi ones.
- Prehistoric volcanic history is not known at any of these volcanoes.
- Observers at existing volcano observatories have little volcanological knowledge outside their specialties, which limits their general understanding.

4.2.1. OVERALL IMPACT

VDAP has had substantial impact on the level of professionalism at the CVGHM, and in their ability to monitor volcanoes within Java as well as elsewhere in Indonesia. Most of the VDAP focus to date has been on installing or upgrading or replacing seismic stations and telemetry network in North Sulawesi during the 2004-2010 period, but that work has included "hands-on" training of CVGHM technical staff from Bandung Headquarters- technicians who are now passing on their knowledge to other colleagues (see 4.4.1.2. List of Trainings). Because of this North Sulawesi training, a cadre of well-trained seismic technicians in Bandung is now capable of installing and maintaining improved seismic stations and telemetry systems throughout Java. The desire to have a place in international professional volcanology has motivated scientific staff at CVGHM to publish the results of their work in Indonesian and foreign journals, and several articles have now been published or are "in press", written by Indonesian scientists, often with VDAP coauthors. VDAP has stressed the importance of attendance at international scientific meetings to bolster the prestige of Indonesian

volcanology and with VDAP and other support; Indonesian volcanologists are now increasingly presenting their work at such meetings.

4.2.2. COVERAGE AND DESIGN

Following the completion of work in North Sulawesi, a major new project to provide technical assistance, infrastructure, and crisis response project is now underway with CVGHM in Java. The goal, again, is to provide seismic monitoring networks at the following volcanoes: Tangkuban Perahu, Cereme, Slamet, Dieng, Raung and Ijen, among Indonesia's most hazardous and least monitored volcanoes. Work in Java began at Tangkuban Perahu in 2010, a 'city volcano' located only 15 km from central Bandung and CVGHM's headquarters, when rising unrest required quick response. CVGHM technicians completed the installation of the network at Tangkuban Perahu with only minimal assistance from VDAP staff (see 4.2.4 below). In 2011 unrest at Ijen Volcano prompted VDAP to move their focus to East Java, and has continued with emergency response at Raung in 2012.

In 2013, the VDAP-CVGHM team will shift infrastructure work from East to Central Java by beginning work at the Dieng Volcanic field, a broad volcanic region with multiple vents and significant volcanic gas hazards, as demonstrated by previous fatal gas-emissions and a gas emission crisis in 2011.

A self-sufficiency initiative for monitoring instrumentation is also being considered through training workshops for CVGHM staff. CVGHM should be able to construct their own seismic monitoring, including radio telemetry and related components, data acquisition and processing circuitry, 12-volt base stations, etc.

As has been mentioned elsewhere, VDAP focus is based on a combination of long term interactions with CVGHM and immediate need. There is never time or effort wasted under these conditions.

4.2.3. EFFICIENCY

As elsewhere, efficiency is measured by comparing cost to results. All of VDAP's work is highly efficient because the inputs provided have been almost fully utilized to maximum effect, where both VDAP and Indonesian agencies provide adequate inputs to achieving the project goals.

VDAP experts have a strong commitment and thorough expertise, and all signs show that VDAP has carried out the expected technical transfer more than adequately. Training was also effectively implemented as evidenced by technicians assembling equipment at Tangkuban Perahu (see 4.2.3. Coverage and Design). Through training courses in Indonesia, Hawaii, and CVO, skills and techniques necessary for volcanic observation and data analysis are being transferred to counterpart researchers, and they have been applying the skills and techniques to their routine work at CVGHM and BPPTK.

The evaluation team compared VDAP's detailed itemized shipping lists of equipment sent to Indonesia, with supplies received and installed in North Sulawesi and other volcanoes. Most or all items were accounted for. Significantly, VDAP installed a well- equipped workshop (see Figures 11 and 12, in section 4.4.2 Equipment) so Indonesian technicians can maintain and repair equipment without further VDAP involvement. The equipment supplied by VDAP is well utilized for carrying out monitoring activities.

The Indonesian counterparts are allocating sufficient equipment, funds, and number of personnel with adequate expertise to make best possible use of VDAP inputs. It should be mentioned, however, that when VDAP plans to come to Indonesia for more than 20 days, it inconveniences the Indonesian staff ("overloads" was the word used). According to Indonesian government regulation, a civil servant may not take more than 20 days leave for training. Thus, VDAP should recognize that a 30 day visit needs to be broken down into several activities to ease adaptation to local requirements. CVGHM would prefer two visits per year, but understand that this is difficult for VDAP because of staffing shortages.

4.2.4. SUSTAINABILITY

VDAP training efforts in North Sulawesi and at training workshops is increasingly providing evidence of sustainability. One example relates to the upgrading of seismic monitoring capabilities at Tangkuban Perahu volcano, which rises 1300 meters above the populated Bandung plain. This volcano had only been monitored

by a single seismic station prior to 2010, and limited seismic information could only be sent to Bandung by fax or SMS messages from the volcano's observatory – earthquake epicenters were thus impossible to locate. Upgrading of monitoring instrumentation had been discussed for future VDAP involvement, but renewed seismic activity in the winter of 2010 made the upgrades urgent. VDAP staff were working in Northern Sulawesi at the time, but Anna Mathovani, a seismic technician who had received hands-on field training from VDAP staff in 2007 and 2009, took charge of the installation and with a CVGHM crew added three new seismic stations and a modern telemetry system in a three week period – with VDAP direct involvement limited to phone calls and e-mail consultation. These new capabilities at Tangkuban Perahu enabled observers to transmit seismic data directly to Bandung CVGHM headquarters for interpretation. The improved seismic network proved its worth this past summer, when increased seismic and thermal activity raised alarm levels to "Waspada" (Warning) levels on August 24, and led authorities to close the Tangkuban Perahu Nature Park to tourism. No eruption ensued, and the Park was reopened on September 23, but the new ability to monitor volcanic unrest and to restrict visitation to this popular, but very dangerous tourist destination is a major contribution to public safety, and will one day be saving lives.

4.3. CRISIS RESPONSE: MOUNT MERAPI 2006 AND 2010

Findings: Merapi eruptions

- Based on monitoring data, BPPTK correctly forecast the direction and the time of the first pyroclastic flows on 11 May 2006.
- VDAP team was diverted from North Sulawesi and installed EARTHWORM software, trained staff in its operation, provided remote sensing data and digital telephoto cameras.
- VDAP collaborated with BPPTK to produce a probability tree of risk to the nearby population.
- In 2010, Indonesian forecasting was accurate. VDAP and Japan were called by the President and asked to verify.
- As a result of VDAP providing radar imagery of the dome thereby leading to the expansion of the evacuation zone hours before the eruption, approximately 15,000 lives were saved.
- Community based organizations were very active in coordinating, communicating dangers (based on lessons from 2006 – CBOs were invited to all coordinating meetings).
- Contingency plans developed by coordinating group were based on 2006 eruption – and thus, not ready for the '100 year eruption'.
- VDAP provided four lahar monitors after the eruption plus knowledge transfer on their use, which directly led to BPPTK's reproducing 10 more monitors and creating one of the world's most advanced lahar monitoring systems.

As the most active volcano among Indonesia's chain of 129 volcanoes, Merapi has been intensively studied and monitored and detailed records of its eruptive history throughout the 20th century are available that show the distance and direction of its pyroclastic flows (Thouret et al, 2000; Wilson, et al, 2007). Its 'fame' has led to what is called a "Merapi-type" of volcano. This is characterized by the "repeated expulsion of viscous, highly crystalline lavas to form bulbous lava domes and thick, stubby lava flows. The gravitational instability and collapse of these extrusions tends to generate violent, although modestly-sized, pyroclastic flows commonly defined as 'Merapi-type' (Voight et al., 2000, see also Pallister et al, Oct 2012)." Figure 10 shows the length and direction of flows for the last 100 years.

The 2006 eruption was a classic Merapi-type: preceded by an increase in volcanic unrest almost a year before the eruption, following its usual 4-5 year eruption cycle. This standard behavior allowed the Merapi Monitoring Unit at BPPTK to forecast the eruption accurately, which led to a public education and preparedness program in collaboration with BPBD during the months leading up to the actual eruption. As activity increased in the spring of 2006, BPPTK issued a revised hazard scenario map that was used to forecast the path of the eruption. As unrest increased (usually when incandescence appears on the lava dome), alert levels were raised, evacuations took place and lives were saved. Based on monitoring data, BPPTK correctly forecasted the direction and the time of the first pyroclastic flows on 11 May.

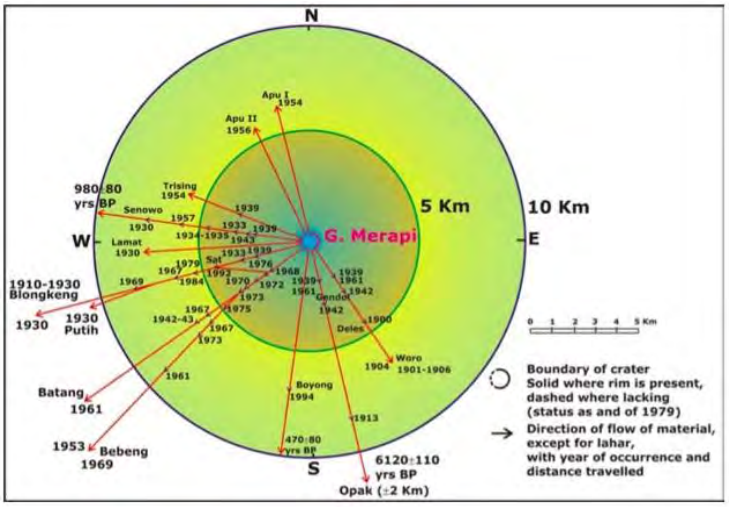


Figure 10: 20th century pyroclastic flows from Merapi (Wilson, et al, 2007:6)

In 2010, patterns all showed the eruption would be much larger than the previous history suggested – what was later termed a "one hundred year eruption." Merapi's 'usual' behavior patterns abruptly changed in late October and early November 2010. This largest and most explosive eruption in more than a century, did not provide the 'usual' extended unrest time, it displaced over 400,000 people, and claimed nearly 400 lives.

Lessons from these two eruptions have dramatically changed risk mitigation in Indonesia. With VDAP support, Indonesian scientists gained access to near-real-time satellite radar imagery, which, along with seismic, geodetic, and gas observations, firmly cemented VDAP – CGVHM – BPPTK relationships during a major volcanic crisis. These two eruptions also reveal changing patterns in community involvement, risk mitigation, and the use and flow of information. Both eruptions exposed the gaps that exist in community understanding of the dangers, local preparedness, contingency plans, evacuation routes, and coordination of all emergency factors.

4.3.1. OVERALL IMPACT

> *CVGHM saves lives and VDAP strengthens that ability" Surono, Director, CVGHM*

2006: VDAP was already in Indonesia working on their KKVO network when they were requested by the Indonesian and US governments to assist in assessing the rising unrest. Upon invitation, VDAP staff arrived and assessed current needs, provided equipment and assisted in assessing the level of activity. As is standard, VDAP material and scientific assistance was not announced and government agencies took credit for a correct assessment of the eruption and the appropriate actions.

While VDAP was not involved in activities beyond monitoring, it is significant to note that once the evacuation warning was issued, next steps were not clearly issued and all parties recognized the need for clearer and better coordinated risk mitigation at local government and community levels.

2010: VDAP was contacted by the president of Indonesia, as were Japanese and French counterparts, to assist in assessing what was obviously leading up to becoming a catastrophic eruption. Upon request, VDAP provided near-real-time interpretation of images from synthetic aperture radar (SAR) signals, which were quickly delivered to the committee responsible for issuing warnings. This allowed satellite remote sensing for the first time to play an equal role with *in situ* seismic, geodetic and gas monitoring in guiding life-saving decisions during a major volcanic crisis. This remotely sensed information about the rapidly changing Merapi volcanic system enabled VDAP to provide timely advice to GOI officials as critical decisions were being made about the extent of required evacuations. This advice was used by GOI to expand evacuation zones from 15 to 20 kilometers just hours before major eruptions devastated large areas on Merapi's flanks, and led directly to the saving of approximately 15,000[9] lives (BNPB report on Merapi 2010, 2012).

The coordinating committee that was informed of the seriousness of the activity by the satellite information by CVGHM Director Surono and BPPTK Director Subandriyo for the first time in any Indonesian disaster also included community-based organizations and disaster monitors, community collectives and NGO watch-groups that mushroomed following the 2006 problems. These well organized groups with their links into social

[9] The BNPB report stated more than 10,000. However the research gathered seems to indicate the number is closer to 15,000 lives saved.

media, such as Twitter and Facebook, community radio and a broad network of volunteers, were able to implement the expanded evacuation zone within hours. This is an example of a successful end-to-end system with BPPTK providing accurate information about the potential of a significant eruption, with technical assistance from VDAP, and the government and community groups organizing rapid evacuations.

Volcanoes are dangerous. Financial losses from the 2010 eruption are estimated at US $781 million. 2,613 homes were destroyed, airports were closed and hundreds of international flights cancelled to and from Indonesia. But volcanoes also make for very fertile farming areas, and thus, continue to attract settlers, who, from time to time, will need to evacuate. Based on CVGHM analyses, nine hamlets in the Cangkringan region are now deemed uninhabitable and residences have been built further away from the Merapi crater for over 2,000 families, 695 of which have refused to resettle. Of the 350,000 people evacuated, how many self evacuated, or how many were not in danger but chose to evacuate because of media coverage of a 'prediction' that all of Yogyakarta would be destroyed, can never be known[10]. 158,645 people were assisted in evacuation centers.

4.3.2. COVERAGE AND DESIGN

2006: A VDAP team was diverted from going to North Sulawesi to Yogyakarta when unrest at Merapi escalated. On invitation by CVGHM, VDAP collaborated with staff at BPPTK and installed EARTHWORM software, trained staff in its operation, and provided access to remote sensing data and digital telephoto cameras for measuring the volume and extent of the erupting lava dome and pyroclastic flows. The VDAP team provided BPPTK with information on hazards and risk and collaboratively produced a probability tree analysis that quantifies risk to nearby population. VDAP continued daily updates on the state of the volcano for a week after departing from Indonesia. In addition to on-site assistance, VDAP provided technical assistance to BPPTK through remote sensing of the eruption by USGS staff based in Reston, VA.

What stood out most to the Evaluation Team from this experience was not, in fact, the monitoring, which was accurate, efficient, and saved lives, instead it was issues that arose from this eruption were those related to other aspects of mitigation, namely socialization, coordination and communication – areas in which VDAP plays no role.

2010: From 26 October to 5 November 2010, Merapi delivered its largest eruption in more than a century (VEI ~4 (on a scale of 0-8), last recorded in 1872), requiring the evacuation of an area of about 1300 km2, killing 382 and displacing more than 350,000 people from the region. Three days before the first eruption, Director Surono realized that clues all pointed to a much larger eruption than the many smaller ones of past decades – all of which was regularly discussed and confirmed with VDAP staff (to provide both moral and technical support). The first eruption destroyed much of the monitoring equipment placed on the volcano. Between the lack of equipment and thick rainy season cloud coverage around the summit of Merapi, Indonesian scientists were working blindly. Upon request for support, VDAP provided near-real-time interpretation of images derived from OMI satellites. The quick delivery of these interpretations to those responsible for warnings, guided life-saving decisions during a major volcanic crisis.

Following the eruption, negotiations on most critical needs with local scientists led VDAP to bring four (acoustic flow monitors (AFMs) to assist with the acute lahar issue brought on by 130 million cubic meters of ash deposits. These AFMs were replicated by BPPTK and installed at all 14 rivers feeding off the slopes of Merapi. This assessing of immediate needs and copying of technical monitors by local staff is exactly the kind of evidence needed to prove that crisis response capacity has been built. In conjunction with VDAP provided CCTVs and open access to GA websites (such as Yogyakarta Siaga Bencana and Merapi Activities), anyone can now see readings from any of the volcanic monitoring equipment including seismographs. These AFM monitors provide approximately 30 minutes of warning to people threatened by mudflows. They save lives but they cannot prevent the destruction of roads, bridges, villages, fields, livestock, etc., that have been inundated

[10] http://news.detik.com/commenturut/2010/11/08/124606/1489257/10/2|2/panik-karena-isu-ledakan-merapi,-ratusan-warga-yogyakarta-mengungsi-ke-solo

each rainy season. Further lahar monitoring work is being done to improve drainage and determine rainfall thresholds for lahar generation.

4.3.3. EFFICIENCY

Efficiency in a crisis response cannot be easily measured as it must be weighed against the need for life-saving rapid response and decision-making, as per USAID/OFDA's and VDAP's mission. In terms of VDAP inputs provided, from equipment and the training to best utilize it to remote sensing imagery, they have been fully exploited to maximum effect. Indonesian agencies provide adequate responses to these inputs in terms of training, maintenance, personnel, and in some cases, replication, that have enabled them to make those life-saving decisions to evacuate or not, which areas are most at risk, and how great a risk it will be.

2006: A VDAP team was already in country preparing for work in North Sulawesi as unrest increased. It was easy for the VDAP team to divert to Yogyakarta, scope out the main needs, and provide EARTHWORM real-time seismic analysis software and the computers to run it, as well as digital cameras for observing the growth of the lava dome. They also consulted on analyzing potential hazards and their forecasts. All of these inputs and analytical abilities have been maintained and improved as evidenced by the 2010 response and the successful adaptations made through BPPTK.

2010: VDAP inputs were mainly remote during the actual crisis. Since the first eruption destroyed most of the monitoring equipment on Merapi's summit, VDAP provided remote sensing analysis that supported the CVGHM/BPPTK expectation of a catastrophic eruption. It was this VDAP input that gave the impetus to an expanded evacuation zone that is credited with saving 15,000 lives. Following the eruption, VDAP brought new seismic stations, four AFMs, and related equipment to replace the destroyed field stations. The equipment was used, along with webcams and other equipment that BPPTK had on hand, to build a lahar warning system to address the newly developing and larger scale issue of lahar hazards following the eruption. With very little cost, one of the world's best lahar monitoring systems was created.

4.3.4. SUSTAINABILITY

It was widely reported by all we interviewed at CVGHM and BPPTK that VDAP's provision of equipment, analysis software, training, and support has been adapted and maintained by Indonesian partners. Since the Merapi Observatory is not on VDAP's partnership list for upgrading, their work in Yogyakarta is by invitation during volcanic crises. Despite the limited opportunities for collaboration, it has been stated by Indonesian based sources (i.e. Directors of Badan Geology, CVGHM, BPPTK) that VDAP input has been more sustainable than others because of the fact that VDAP's goal is to save lives and not aimed at basic science questions that appeal to academic grant agencies, rather than the operational needs of an observatory that has a mission to prevent disasters. Instead, VDAP's work takes into account local priorities and local capacity as a basis for sustaining the monitoring effort.

4.4. OTHER KEY FINDINGS

Findings: Training

1. Efficiency: Individual and one-to-one training is expensive and labor-intensive. It is difficult to standardize and replicate. However, as practiced in the field, learning-by-doing remains the most effective and thus cost-effective in the long run. By building personal relations and mentorships, reinforcement, follow-up, and troubleshooting becomes easier.
2. Records of training topics, curriculum, frequency, participants, gender and new skills were not maintained or reviewed, nor is there a system of student or teacher evaluation.
3. According to some, trainees, the efficiency of some training was reduced because of English language difficulties.
4. Training of all types should be planned and recorded with information regarding topic, curriculum (where possible), hours or days, numbers and gender of participants. New skills and knowledge gained should be explicitly described.

4.4.1. TRAINING

The key to sustainability is improving Indonesian capacity to monitor volcanoes within a strong institutional structure. Capacity building involves institutional strengthening, technology and equipment transfers and knowledge, skills and attitudes development. Training, broadly defined, has been instrumental in developing capacities of CVGHM and BPPTK staff, observers, and technicians in various fields related to volcano monitoring. According to the research of the evaluation team, along with CVGHM and CVO records, VDAP has supported and directly provided training to more than 60 CVGHM scientists and technicians and staff. CVGHM staff of approximately 500 persons, also participates in training conducted by the education and training division of the Ministry of Energy and Mineral Resources' Geology Agency. CVGHM staff trained by VDAP served as teachers and resource specialists in this in-house trainings, thereby further extending the reach of VDAP training.

According to Pak Surono, 24 of the scientific staff and 21 observers "worked or trained with VDAP staff, formal or informally." Twenty-one scientists and two observers "received VDAP training in formal workshops" and 20 scientists "visited or received training at USGS volcano observatories." Sukhyar, GA Chief, expressed his wish that VDAP host major training courses in Indonesia – using Indonesian examples. He supports training of Indonesian volcanologists in Hawaii and at the CVO, and asked if VDAP could sponsor training in Indonesia that could impact many more students at lower costs. (It should be noted that this Evaluation Team suggests that VDAP explore ways to improve Volcanology studies at Indonesian universities and pursue the nascent cooperative program of exchanges with a consortium of Pacific Northwest universities.) He suggested that during future VDAP visits, such training "camps" could attract other students from South East Asia and western Pacific countries with volcanoes and Indonesia could become a world center for learning "applied volcanology."

4.4.1.1. TYPES OF TRAINING

Since 2004, VDAP has developed and provided education and training. Participants are general scientists, technicians, staff at observatory posts, as well as IT staff. Training is conducted in the following ways, by order of prevalence:

- One-to-one demonstration and mentoring with US VDAP scientists and Indonesian scientists, technicians. VDAP records indicated at least 19 of these "learning by doing" trainings since 2004. For example: EARTHWORM software installation at KKVO in February to March 2007 with Mr. Dali A. Munandar, Mr. Kristianto, Mr. Mardian Hardipto and Mr. Ahmad Basuki was conducted with VDAP-affiliated scientist Dr. Seth Moran. Installation of various equipment offered "training

opportunities" for other staff at observation posts. This one-to-one coaching is extended through email, telephone, text messages and exchange of articles and books.

- Formal workshops and trainings sessions in Indonesia. By mutual agreement, leadership of CVGHM and VDAP determine training priorities, schedules and topics during the work plan development process. Approximately nine formal trainings and workshops were conducted by VDAP at CVGHM in Bandung and at KKVO. Specific examples include: "Remote Sensing and Lahar Hazard Modeling" conducted for five days with participation by CVGHM scientists and other international participants; and "Introduction to Software Tools for Volcano Seismology" for two days with CVGHM staff and management.

- Formal Study at University of Hawai'i – Center for the Study of Active Volcanism (CSAV) - The annual CSAV volcanic monitoring course takes place during 6 weeks in June and July. VDAP co-sponsors the course by providing travel funds to developing-country scientists who are members of counterpart agencies with whom VDAP is associated. Eighteen Indonesian scientists have taken this course since 1999. Courses include sessions led by USGS, VDAP, and academic partner scientists on the use of seismology in eruption forecasting, lahar inundation modeling, deformation monitoring and modeling, volcanic gas instrumentation and monitoring, hazard mapping, remote sensing and hazard communication.
- Formal Workshops and Field Camps at Cascades Volcano Observatory in Vancouver, Washington, USA. A total of 19 Indonesian CVGHM staff has traveled to Washington for intensive field study, research and practicum at CVO since 2005.

- Formal Satellite Data Workshop held outside Indonesia at the Earth Observatory Singapore included CVGHM scientists and other international participants.

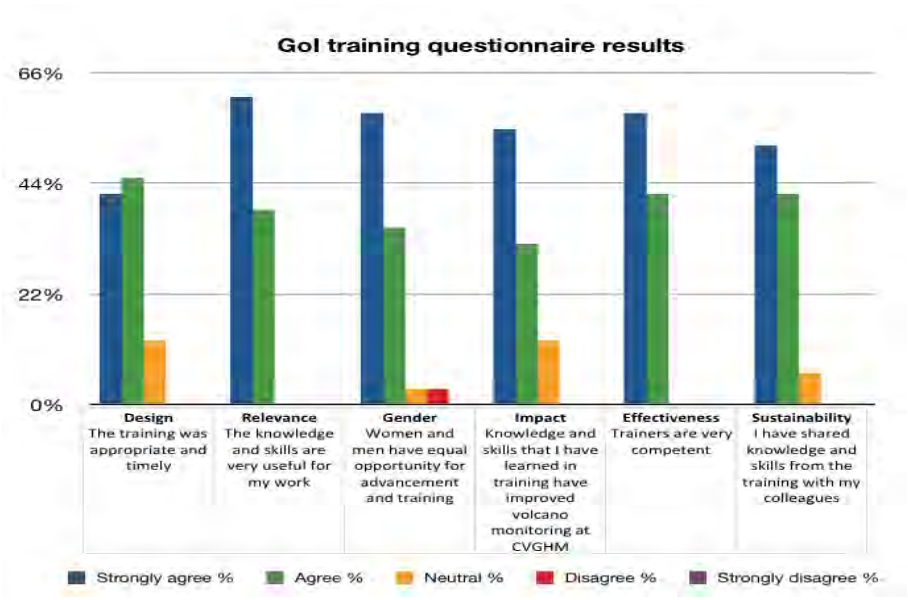
4.4.1.2. LIST OF TRAININGS

The table in Annex E is a partial list of training activities sponsored by VDAP. The evaluation team was unable to complete a comprehensive list since neither VDAP nor CVGHM maintain complete training records.

Training of all types should be planned and recorded with information regarding topic, curriculum (where possible), hours or days, numbers and gender of participants. New skills and knowledge gained should be explicitly described.

4.4.1.3 OTHER FINDINGS: TRAINING

Thirty one Indonesian CVGHM (27 male, four female) employees completed an anonymous (where possible-some were emailed) questionnaire regarding their VDAP training. The results are in the accompanying bar chart to the side.



Over 80% of trainees agreed or strongly agreed with statements that their training was timely, useful, well-taught, appropriate, and provided them with skills they passed along to colleagues.

4.4.2. EQUIPMENT

One of the major accomplishments of the VDAP program in Indonesia during its eight-year existence has been the provision of large amounts of scientific material to the CVGHM. This material has enabled Indonesian volcanologists and technicians, working initially with VDAP staff, but increasingly on their own, to install or upgrade 66 seismic stations at Indonesian volcanoes (Kristianto, 2012, written communication). Over 600 boxes and trunks of material have been shipped to CVGHM since 2004, weighing over 17,000 lbs. The most important material consists of seismic stations and the related components (summarized in Figures 11 and 12) but also includes radio transceivers, LCD monitors, electronic components, testing equipment, cables, wiring, power supplies, repair tools, equipment boxes, drum recorders, computers, video cameras, GPS units, GPS components, field equipment and textbooks. This material has been used to upgrade volcano monitoring capabilities at individual volcano observatories on more than 20 volcanoes, with excess equipment (e.g. antennae) cached at CVGHM Headquarters and KKVO, where it is available to repair or replace broken field equipment.

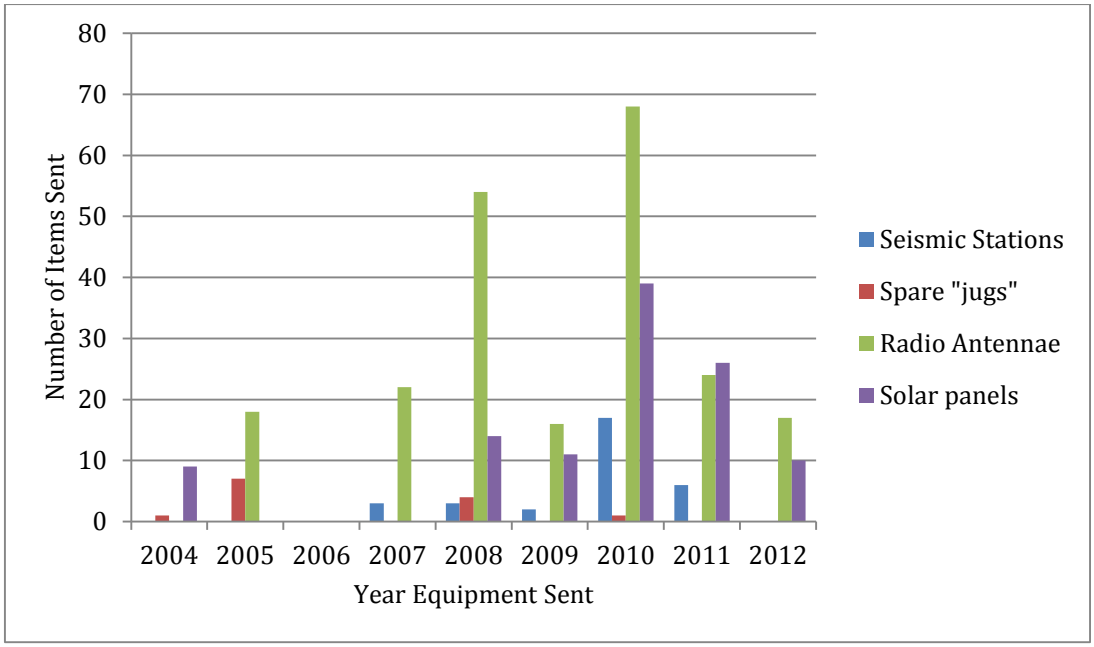


Figure 11: Numbers of major seismic components sent to Indonesia by VDAP from 2004-2012. Data supplied by VDAP.

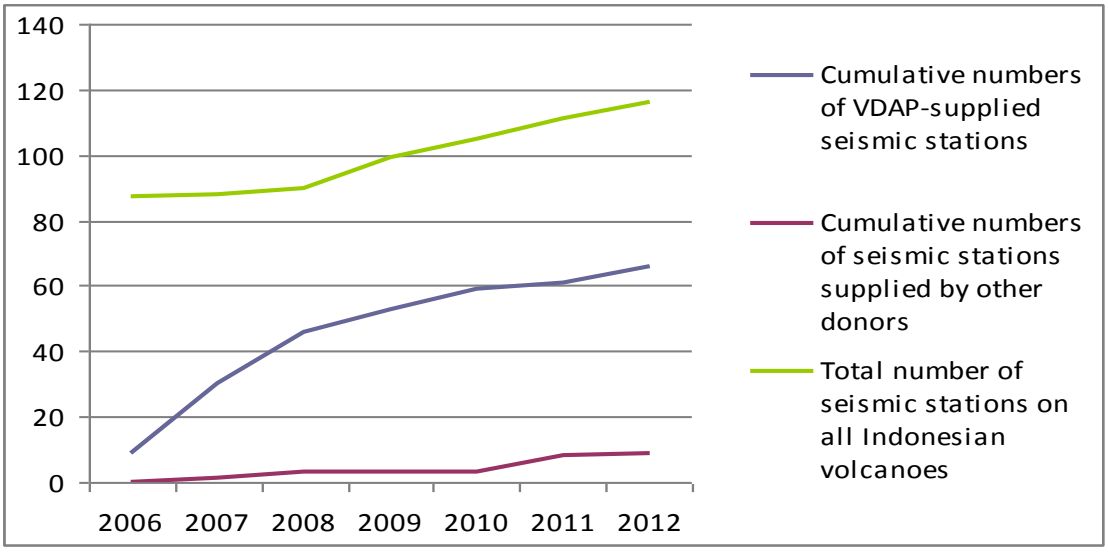


Figure 12: Number and sources of seismic stations on Indonesian Volcanoes.

4.4.3. GENDER EQUITY

Gender as a development issue in this context of human resources capacity building was not found to be a focus of the program design and integrated into project implementation. All volcanological agencies (BG CVGHM, BPPTK) are government agencies, therefore access to these jobs and participation in trainings follow Indonesian civil servant hiring procedures based on national and equitable gender hiring laws. However, only an estimated 5% of the 600 employees at CVGHM are females. Participation in capacity building activities such as workshops, training, field camps, one–on–one consultation and mentoring as well as in-house training is open to both men and women. Selection of participants to capacity building activities is based on equipment up-grading, which means that VDAP trains those with relevant job responsibilities and on a need to know basis. As more and more women are entering the geology and other science fields, gender balance should improve – as it has been doing in VDAP's own ranks.

For most women scientists and technicians, we were told that their academic backgrounds shaped their careers. In Indonesia, volcanolgy is considered a "man's world." However, one female scientist explained to us that her father was a geologist and that exposure to the father's job since childhood led to her interest in volcanology.

All the 160 observatory post staff are men, due to the working environment and security issues that are more dangerous for women. Culturally, it would be difficult for women to work at regional observatories because of the more 'rural', conservative gender expectations (in Indonesia) as well as the need to work 24 hour shifts in isolated areas, the physical requirements and abilities which are associated with men. Urban centers, such as BPPTK, actually have more female than male staff (according to Director, Dr Subandriyo, women make up 65% of BPPTK's staff).

In general, there are women scientists, although few compared to men. Among the currently employed at CVGHM, of eight technicians, three of them are women. In BPPTK in Yogyakarta, three out of four section heads are women including the Merapi Monitoring Section.

Based on limited data on training (which we attribute to poor program documentation at both VDAP and CVGHM), of more than 60 training participants over the program period, 18 or 30% of the participants are women.

There is a law that regulates gender mainstreaming into all ministries and government agencies, institutions and programs (i.e., Presidential Instruction No. 9/Year 2000). While the legal framework for gender equity in all government offices was not known to CVGHM directors, they still comply with its equity requirements[11].

In short, VDAP has no role or impact on gender issues in Indonesia. VDAP, however, employs female staff who lead trainings and other significant work. This example of gender leadership was not considered a problem or a hindrance in any way by the men or women we met in Indonesia, as evidenced by the survey and personal communications. Within Indonesian agencies, men and women have equal access to advancement as evidenced by the numbers of female section heads although access to VDAP supported training does show a lower number of women.

4.4.4. RISK MITIGATION PARTNERSHIPS

Forecasting how and when a volcano will erupt is only one part of the mitigation process. Communication, coordination, socialization are all essential partners to volcanic monitoring. As discussed above, the lack of coordination during the Merapi crisis in 2006 resulted in a very changed system that now involves a much broader partnership. Add poverty and political motivation to the mix, and risk mitigation becomes far more complicated again.

Volcanic monitoring is managed well by CVGHM utilizing its Early Warning Protocol (see Table 3 below). Once a warning level reaches Siaga (level 3), the National Disaster Mitigation Agency (BNPB) takes over in conjunction with CVGHM and local government. In line with Indonesian law No 24/2007 on Disaster Management, BNPB is responsible for issuing alert levels at Siaga and evacuation orders at Awas (level 4). Dr Supriyati, the head of outreach communication and risk analysis at CVGHM, admits that her task is extremely difficult because a) the hazardous regions are simply too many and too wide to be covered by just one agency, and b) communities do not understand the dangers involved. Since 2010, however, it has been the practice to increase collaboration between government agencies in coordination; to have local governments organize simulation exercises; to create hazard maps and evacuation routes; and for all to collaborate on contingency plans. While the evaluation team was not tasked to examine the non-monitoring aspects of risk mitigation, we were informed repeatedly by GOI and CBO staff that government agencies require a great deal of capacity building in these areas. The inclusion of CBOs during the 2010 Merapi eruption seems to signal CVGHM's acceptance of the need for more community-based support in managing disasters. In fact, CBOs were so effective in saving lives because of their access to new media, opportunities government agencies rarely use well (see combine.or.id, bbc.com; http://www.cdacnetwork.org/public/resource/policy-briefing-still-left-dark). It was clear that inclusion of CBOs and NGOs in the emergency plan is not part of the standard protocol for volcanic crises (see Table 3). Surono himself made the demand for their inclusion in 2010. As this change in process was not part of our SOW, and lies beyond VDAP's direct crisis work, we did not investigate further through BNPB. However, we do see a broadened definition of risk mitigation as highly relevant to VDAP's future work in Indonesia.

Table 3: Early warning protocol

Normal	Waspada	Siaga	Awas
No eruption in foreseeable future.	(Alert): Increasing seismicity and other volcanic events.	(Prepare) Intensively increased seismicity supported by other volcanic monitoring data. Eruption possible within 2 weeks.	(Beware) Eruption possible within 24 hours.

[11] As per personal communication, Surono, Director CVGHM, 5 October and verified by staff during October 2012 focus group discussion. All felt more women were moving into the field and this increase in numbers would improve gender equity in Bandung.

Standard 2 times daily reporting to CVGHM by radio. Monthly reports sent also to provincial and regional government	Report twice daily by radio; Monthly to local government. PLUS weekly report to head of CVGHM. Residents should not engage in activities within evacuation zones	Observers send SMS report every 6 hours directly to Director of CVGHM. Crisis team reports daily; weekly evaluation sent to head of CVGHM, head of BG, provincial and district government, and Air Traffic Safety Directorate.	Crisis team comes from Bandung to coordinate with BPBD. Reports as in Siaga with additional coordination with regent, governor, SaR. Evacuation called for those in Area 3. Area 1 & 2 must be prepared to evacuate

By examining the numbers and causes of death during the 2010 eruption, we see that roughly half of the deaths were caused by the eruption, whereas the rest were evacuation-related. Personal communication from BNPB staff and CBO staff has verified that most were elderly or young and deaths were attributed to heart attacks, stress, lack of facilities, shortages of food, water, basic needs at evacuation centers, and crashes in the crush to escape. Four deaths were caused by neglecting basic disaster warnings to avoid riverbanks and leading people to 'safety' by crossing the Gendol River (Glagahardjo). No deaths were attributed to delayed evacuation warnings.

It is well known that people living closest to hazard zones tend to be poor and make their livelihoods within these regions. Volcanic ash mining for construction, sulfur mining, growing and harvesting crops in the fertile soils, grazing livestock, selling food, drink, souvenirs to volcanic tourists are all high risk jobs accomplished by people who generally live on less than US$2 a day. Thus, people are reluctant to obey warnings, and some outright protest when orders are given to leave a hazard zone because a day without work and income is often a day without food. Issues of politics, economics, social and religious beliefs cannot be avoided in Indonesia, nor are they consistent across the archipelago. Collaboration between the scientists, hazard monitors, and institutions such as universities and local communities/organizations for disaster prevention is important in order to provide information directly and in simple language that contributes to a much stronger disaster reduction policy and practice. The lack of any evacuation plans for the more than 61 thousand cattle in the region resulted in the deaths of 3,513 cows in Sleman alone (and 288 in Klaten, 70 in Boyolali, and 29 in Magelang, arsip.gatra.com//2010-12-20/artikel.php?id=143820). Livestock is a main livelihood investment for many that needs to be addressed for humanitarian and safety reasons, too[12]. The expansion of the 'Red Zone' to include nine hamlets resulted in the local government building 2,128 new homes to resettle these families. A full one-third of them have refused to move and have started rebuilding their destroyed homes (report from Sri Purnomo, Bupati Sleman). The demands of disaster prevention need to be given more attention as an essential complement to the mainly technical cooperation aspects of VDAP's volcanic hazard monitoring.

Table 4: Number of deaths attributed directly and indirectly to Merapi eruption

District	Eruption	Burn Deaths	Non Burn Injuries	Total
Sleman	**I**	37	0	37
	II	153	87	240
Total DIY		**190**	**87**	**277**
Klaten	**II**	8	33	36
Boyolali	**II**	0	12	
Magelang	**II**	0	56	56
Total JATENG		**8**	**101**	**109**

[12] Reimbursement from government agencies for a human death was four million rupiah and averaged 8.5 million for a cow depending on size, sex and age. The difference is related to purpose. A cow can be purchased again, which is what the money was intended for. The human cost was a donation for the family to be used for funeral arrangements or home repairs.

District	Eruption	Burn Deaths	Non Burn Injuries	Total
TOTAL DIY + JATENG		**198**	**188**	**386**

Source: Ministry of Health 9 Dec 2010; *Laporan Akhir Tanggap Darurat Satgas Merapi 2010.*

4.4.5. SCIENCE DIPLOMACY

VDAP has contributed in significant ways to strong and "consistent"[13] US-Indonesian scientific partnerships. USAID/OFDA Regional Advisor Harlan Hale defined science diplomacy as, "the goodwill and public relations that the US gets from VDAP." According to Hale, increased US Indonesia scientific and technological cooperation is, "always a push-pull as VDAP strives to build capacity and raise the profile of the CVGHM from the background; whereas the State Department would like to see the US get some credit for it."[14]

According to Alfred Nakatsuma, until recently the USAID/Indonesia Environmental Officer, both US Ambassadors Hume and Marciel were very supportive of VDAP, and they realized the US focus on disaster risk reduction was "very politically important in Indonesia."[15] Mr. Nakatsuma cited the World Oceans Conference in Manado in 2007, which coincided with the arrival of hundreds of pieces of equipment for North Sulawesi KKVO, and received a media splash. Mr. Nakatsuma called it, "Great public diplomacy!"

VDAP's role in crisis response is a good opportunity to show a dynamic friendship and full partnership. Mr. Hale cited the example of the invitation to VDAP Chief John Pallister and CVGHM Director Surono to meet together with Vice President Boediono in appreciation of VDAPs role in the decision to widen the exclusion zone during the Merapi 2010 eruption. The Vice President acknowledged that VDAP played a "very significant role" in saving thousands of lives in the response to the Merapi eruption in 2010.

VDAP contributes to US diplomacy bilaterally by:

- Building scientist to scientist relationships,
- Enhancing partners' stature and standing,
- Being seen as entirely non-political; it is an example of US use of "soft power"
- Working only at the invitation of the GOI, never unilaterally, and taking an advisory role working behind the scenes.

Evidence of effective science diplomacy includes mutual adaptation and sharing of technology, regular and informal information sharing, frequent joint mid- and senior-level exchanges, dozens of co-authored collaborative research publications, and joint participation in academic and professional meetings. For example, John Pallister lead a CVGHM volcanology team, conducted fieldwork and completed a draft report with CVGHM counterparts and VDAP colleagues on the five eruptions at Soputan volcano during the past three

[13] Both Surono and Sukhyar cited VDAP 'consistency" during team interviews.
[14] Interview with H. Hale, USAID Jakarta, September 26, 2012.
[15] Interview A, Nakatsuma, Jakarta, Sept 29, 2012.

years. The report was published in CVGHM's Journal of Volcanology and a derivative paper was printed in an international journal.

VDAP efforts in Indonesia contribute to Science Diplomacy in two additional ways: 1) improved monitoring and eruption forecasting by CVGHM enables Indonesian agencies to do a better job of providing Ash Advisory information to the world's aviation community – thus making international air travel safer; and 2) the enhanced CVGHM capabilities to detect and analyze regional earthquakes by observations from volcano seismic stations, and to disseminate this information rapidly via improved communication networks, offers the GOI an opportunity to make these data available in near real time to the international community, contributing to improved understanding of regional tectonics and Earth structure.

Science Diplomacy is a two-way street. Not only does Indonesia benefit from the US, but the US benefits from Indonesia in the following ways:

- **Indonesia is the world's library and laboratory** for Volcanologists. VDAP cooperation benefits the USGS domestic program in advancing the science of eruption forecasting and the breadth of experience for USGS staff.
- **Improved monitoring technology:** e.g. Lahar monitoring technology, developed and installed on Mt Merapi after the 2010 eruption, is the prototype for lahar monitoring which the USGS is now installing on Mt. Rainer in Washington.
- **Improved eruption forecasts** through better understanding of volcanic processes and hence, reduced volcanic risk domestically.
- **Volcano monitoring information,** contributed by VDAP through the Global Volcano Program at the Smithsonian Institution is a "fringe benefit" which aids the international volcanological community.
- Provides **enhanced early warning** of eruptions in the Pacific theater – improves ash cloud warnings to aircraft and eruption notification to Department of Defense Pacific Command.

4.4.6. QUANTIFYING FINDINGS

As with all capacity-building programs, VDAP's role in saving lives is generally indirect, and can be measured over the long term. VDAP saves lives long-term through its commitment to enhance and improve the coverage and quality of volcano monitoring equipment, and to improve the capacity of Indonesian scientists and technicians. As a result, institutions are better able to provide timely and accurate information to local officials who have authority to respond. VDAP's present assistance will thus continue to indirectly save Indonesian lives long into the future. As a crisis response partner, VDAP cannot directly save livestock, farms, homes, infrastructure and other local livelihoods, as this is the domain of the local disaster management agencies. Attribution to VDAP for lives and livelihoods saved cannot usually be accurately enumerated, since VDAP does not advise on evacuation policies or decisions unless that advice is requested. (Interview, Pak Surono).

Since 2004, Indonesian government officials have ordered at least four evacuations due to volcanic crises. Most consequential was the evacuation of the very densely populated area surrounding Mt. Merapi in 2010. Information about rapid changes in the volcano was made available to alert VDAP observers at CVO who relayed this information to CVGHM, providing authorities with the evidence they needed to decide to further expand the exclusion zone. VDAP leaves the decisions on evacuation to government officials, the national disaster management agency and political leaders who face an intricate calculus of potential risks from evacuation (loss of life and property, assumption of support costs for evacuees, the political risk of miscalculation), and the benefit of saving lives.

Three of the evaluation questions from the evaluation SOW are addressed below.

v) What are (sic) the number of lives and amount of property saved in part due to VDAP assistance?

Although VDAP's role in saving lives is both long-term and indirect, in the specific case of the Merapi response in 2010, an additional 15,000 people evacuated the area around Merapi after the exclusion zone was expanded

based on information provided by VDAP. Five hundred people were evacuated from the area of Karangetang in 2007, after frequent eruptions were monitored with VDAP-supplied seismic and telemetry equipment and remote sensing data provide to CVGHM. Through its commitment to enhance and improve the coverage and quality of volcano monitoring equipment, and the capacity of Indonesian scientists, technicians and institutions to provide good timely information to local officials who have authority to respond, VDAP has saved lives and will continue to saves lives in the future.

vi) Is VDAP assistance cost-effective and how has it impacted the economies where they have worked (e.g. value of preservation of livelihoods)?

VDAP programming is efficient and very cost-effective. The combined USGS and USAID/OFDA funding in Indonesia of VDAP programming is approximately US$800,000 per year and covers salaries of VDAP scientists at CVO, equipment, crisis response, and travel. Beyond the incalculable value of human lives saved indirectly attributable to VDAP, the United States and Indonesia share the intangible benefits of improved safety and confidence, shared scientific knowledge and exchange and bilateral trust and goodwill.

vii) How much USG money was saved due to timely evacuation as a result of VDAP assistance that would normally have been spent on disaster response?

The evaluation team reviewed several studies on the costs and benefit of Disaster Risk Reduction,[16] (C Newhall,) and solicited assistance from members of professional evaluation organizations (IDEAS, ALNAP, IPDET) in search of common metrics. The World Bank, the purported source, debunked even the oft-cited ratio of "$1.00 spent on DRR saves $7.00 in emergency response."

This evaluation team's research on the question of lives saved began with a review of the VDAP quarterly and annual reports, as well as the CVGHM reports to obtain a picture of the range of VDAP activities and to seek evidence of life-saving inputs, outputs, outcomes. The evaluation team studied World Bank Global Fund for Disaster Risk Reduction research on the value of statistical life[17], an analysis tool used to assign an economic value to changes in the risk of loss of human life. The "value of statistical life" reflects,

> "The aggregation of individuals' willingness to pay for fatal risk reduction and therefore the economic value to society to reduce the statistical incidence of premature death in the population by one." [18]

Abhorrent though the concept is, it is useful in calculating the cost and benefit of DRR. Studies on the value of a statistical life have been extensively conducted in the developed world; however, few such studies can be found for developing countries. The calculation is based on the average earning capacity of person over a lifetime, and calculations for mid-range countries like Indonesia place a value of $250,000 per life.

The case of the VDAP response to the Merapi crisis in 2010, presents an unusually clear example of VDAP assistance resulting in lives saved. As discussed elsewhere in this report (see 4.3 Crisis Response: Mount Merapi 2006 and 2010) urgent information provided by VDAP prompted the Government of Indonesia to expand the exclusion zone from 15 to 20 kilometers radius from the summit, evacuating perhaps an additional 15,000 persons (according to the VSI) from harm's way hours before a major eruption. According to the BNPB, the total number of people evacuated reached almost 400,000. (According to Subandriyo at BPPTK, as many as 250,000 uncounted, additional people may have self-evacuated before and during this time frame.) Using the very conservative figure of the additional 15,000 lives saved (estimates ranged from 10,000-20,000) credibly attributable to VDAP assistance, valued at US$250,000 each, the "savings" would be US$3.75 billion. Yet, the actual money paid to victims of the Merapi eruption by the GOI was IDR 4,000,000 (US$400) per person and

[16] Kenny, Charles, "Why Do People Die in Earthquakes? The Costs, benefits and Institutions of Disaster Risk Reduction in Developing Countries", The World Bank, Sustainable Development Network, Policy Research Working Paper # 4823, January 2009.

Newhall Chris, and Henley, James and Stauffer, Peter, "Benefits of Volcano Monitoring Far Outweigh Costs-the Case of Mount Pinatubo", Reducing the Risks of Volcano Hazards, USGS Fact Sheet 115-97, 1997.

[17] Jie He; Hua Wang, "The Value Of Statistical Life, The World Bank Working Paper, Sept. 2010

[18] Ibid.

IDR 7-12,000,000 (US$ 700-1,200) per cow[19]. The fund for a cow was to replace it, whereas the amount paid per person was to cover funeral costs and home repairs.

5. CONCLUSIONS

The following section lists the findings and conclusions that have been drawn from the evaluation experience:

Overall Performance and Impact

- Overall performance was outstanding and impact is substantial. Strategic objectives as defined in the annual work plans under the Interagency Agreements were achieved and frequently exceeded, both in number of activities and timing. The evaluation team found evidence of sustained strengthened capacity of Indonesian authorities to monitor and respond to volcanic crises. Although exact numbers are difficult to calculate, VDAP assistance likely contributed to saving 15,000 lives during the Merapi crisis response in 2010 alone.
- With modest financial investment, VDAP in Indonesia has demonstrably enhanced the capabilities and stature of the national volcano monitoring organization, and through its crises responses, has saved lives.
- CVGHM's and GOI's capacity to understand, forecast, prevent and respond to volcanic crises was improved.
- As a direct result of VDAP-provided equipment and training, CVGHM has improved both crisis response (e.g. Merapi 2010), and the competence to avoid unnecessary evacuations, based on improved information and skills (e.g. Soputan in 2011 and Raung in 2012).

Overall Performance: Lives Saved

- The impact of VDAP's capacity building and some crisis response work is both long-term and indirect and therefore is difficult to quantify. In the case of the Merapi crisis response in 2010, however, VDAP provided critical information that was used to expand the evacuation zone, saving approximately 15,000 lives. Overall, with beneficial VDAP-provided skills, such as the ability to more deeply analyze seismicity using the EARTHWORM software, to analyze risk through probability trees, and to increase lahar hazard warnings through VDAP-provided monitoring equipment (see Annex D for more), Indonesian volcanology has vastly improved its overall performance – which is evidence of a very successful implementation of VDAP objectives.
- In general, lives and property saved and livelihoods protected cannot be attributed directly to VDAP assistance, although there is some causality demonstrated by the increase in GOI capacity, which is the ultimate sign of success in VDAP's work in Indonesia.

Efficiency

- VDAP assistance is efficient and cost-effective, given the relatively low investment (approximately $1.25 million average annually over the past seven years for work worldwide) to support salaries, training, travel, cache and equipment, and crisis response.
- Limited resources (donated equipment, training, cooperative work) are utilized sparingly to maximize effectiveness. VDAP is viewed as a leader by the GOI and other donors, whose work and coverage is coordinated by CVGHM, and undertaken cooperatively to minimize duplication and gaps. Unlike other donors that focus on their own research programs, VDAP cooperates with CVGHM and donates all of the monitoring equipment brought into the country.

[19] As mentioned in government reports, NGO reports and newspaper coverage.

- According to informants, much of the VDAP impact is in intangible benefits that include improved safety and confidence, scientific knowledge improvement and exchange, and bilateral trust and goodwill.

Coverage and Design: Relevance

- VDAP works in close partnership with CVGHM, and planning, priorities and location are jointly determined through a long-term negotiation process. Since geological hazard monitoring is a government agency activity, there are no alternatives to CVGHM beyond the academic route, which is beyond VDAP's scope in Indonesia.
- The regional network capacity building focus in the North Sulawesi program is viewed by CVGHM as a model and is now being replicated in Java and across the archipelago. As appropriate, the primary beneficiary group is CVGHM staff and scientists. Secondary beneficiaries include broader risk mitigation groups and at-risk populations. Respondents indicated that VDAP support is relevant, timely, practical and most of all, consistent.
- Responding to requests from the GOI, VDAP design has been flexible, expanding from crisis response only, to capacity building in North Sulawesi and then to Java.
- Respondents indicated that VDAP design is well-suited to Indonesian needs: evidence includes successful history of close communication, negotiation of needs and mutual respect.

Sustainability

- Improved capacity of the CVGHM to respond to volcanic crises and to mitigate risk has been demonstrated both in crisis response (esp. Merapi 2010,) as well as the avoidance of unnecessary evacuations and risk based on improved information and skills (e.g. Soputan 2011 and Raung, 2012).
- The newly established Kakaskasen Volcano Observatory (KKVO) is Indonesia's first regional network, linking 10 active volcanoes, providing real time data to the KKVO hub and CVGHM in Bandung. Overall, 13 new seismic stations and other monitoring equipment have been donated and installed. Equipment is being maintained, repaired and replaced by Indonesians without VDAP involvement. Over 90% of VDAP trainees report they have passed their new skills on to others.

Gender Equity

- VDAP had no direct role in ensuring gender balance in program involvement. Neither CVGHM nor VDAP has control over civil service hiring policies, but both support gender-neutral responsibilities and assignments within appropriate cultural contexts. Approximate numbers of female employees at CVGHM are only about 5% of all staff, but at Balai Penyelidikan dan Pengembangan Teknologi Kegunungapian (BPPTK), women make up 65% of the workforce, possible due to its urban location. In both locations, however, men and women hold balanced numbers of senior positions.
- Observers who serve in often isolated posts away from families are all men.
- VDAP and CVGHM adhere to government policies of non discrimination in hiring and advancement, assignments, and training opportunities.
- 98% of survey respondents agreed that men and women enjoy equal access to work and advancement.

Cross-Cutting Issue: Training

- VDAP's mix of training techniques, including primarily one-on-one cooperative learning by doing field equipment installation, with some formal workshops and classes, offers tightly focused technical training and long-term follow-up mentoring, reinforcement and support.
- Trainees responded favorably to methods, content, quality, and appropriateness of training.

- However, records of training needs and priorities, curriculum, attendance, results (skills, knowledge and attitudes), frequency, and gender participation were not maintained, making assessment and evaluation difficult.

Cross-Cutting Issue: Science Diplomacy

- VDAP represents the strong and supportive role of US science diplomacy in Indonesia. VDAP scientists work with and within GOI structures and are acknowledged and appreciated for their supportive technical assistance, their collaborative approach.
- VDAP work contributes to US diplomacy through building scientist to scientist relationships.
- VDAP's work is considered non-political, non-intrusive, and non-judgmental of Indonesia's strengths and weaknesses in relation to hazard monitoring. VDAP is seen as having very positive benefits by achieving its goals. VDAP is thoroughly respected and this non-threatening position has led to deep trust.
- Evidence for successful science diplomacy includes senior level exchanges, dozens of co-authored collaborative research publications, mutual adaptation and sharing of technology regular and informal communication and close working relationships.

Conclusions: North Sulawesi

- As the first regional network in Indonesia, VDAP succeeded in creating a functioning telemetry system that allows for centralized monitoring of ten volcanoes in a very difficult to reach area. VDAP provided seismometers, radio repeaters, solar panels and other equipment and expanded data transmission bandwidth so that KKVO can now transmit three times as much data to CVGHM in real time, thereby advancing seismic monitoring and interpretation abilities and improving public safety. Equipment is being maintained by Indonesian staff.
- VDAP provided one-to-one equipment installation and workshop training in seismic deformation, and gas monitoring. The trainees (mostly from CVGHM-Bandung) have subsequently trained other staff. This is a model for training technicians anywhere, and will certainly be applicable to Java. Better communications capabilities in Java will allow more sophisticated network design training.

Conclusions: Java

- The original program to monitor eight volcanoes was reduced to six when two were ceded to Earth Observatory Singapore for monitoring purposes. The selected volcanoes have better access to roads, power, and communications than those in North Sulawesi. Prehistoric volcano history is not known at these volcanoes, impeding thorough understanding of eruptive history.
- Still in its early stages, the evaluation team only saw VDAP input at Tangkuban Perahu volcano. Increased activity at this volcano in 2011 showed how VDAP trained technicians were able to install and use equipment on their own to effectively respond to developing unrest.
- The numbers of volcanoes to be monitored and their accessibility makes this work easier than what was accomplished in North Sulawesi.
- Less effort per volcano will be required for seismic station installation.
- Geologic mapping is needed with chronology.
- Observers need broader-focused training in order to understand "their" volcanoes better.

Conclusions: Merapi

- Improved crisis response is the ultimate goal of the Indonesia capacity building program. When invited to assist, VDAP does quick analyses of needs, meets those needs and ensures the host agency retains

all credit for a job well done. During both of these eruptions, Indonesian scientists used VDAP support to good effect and successfully saved around 15,000 lives in 2010.

- Lessons from Merapi have dramatically changed risk mitigation in Indonesia.
- For the first time, near-real-time satellite radar imagery played an equal role with seismic, geodetic, and gas observations in monitoring activity during a major volcanic crisis, firmly cementing VDAP – CGVHM – BPPTK relationships.
- VDAP input has a clear impact on numbers of lives saved and on capacity building for Indonesian independence in crisis response, *but* it has no effect on saving livestock, farms, homes, infrastructure and other local livelihoods. These domains are those of the local government and disaster agencies.

6. RECOMMENDATIONS

Based on review of many documents, interviews with GoI (national, provincial and district), civil society, private sector and CVGHM stakeholders, as well as the findings and conclusions above, the independent evaluation team recommends that:

- Plan to continue support to VDAP through the proposed 2012-2017-work plan, but respect the CVGHM Blueprint, which calls for complete monitoring systems at all PP1 volcanoes (i.e., those 76 volcanoes with high priority risk through proximity to populous areas), improved capacity for observers, and increased ability to make and procure their own instruments by 2014. CVGHM plans to be self-sufficient in basic seismic monitoring instrumentation by then.
- VDAP and GOI develop a strategic plan to cover the period of 2012-2017. Elements of this plan should include an overall goal statement and strategic objectives with measurable indicators, inputs, activities, outputs, outcomes, and results. Post 2017 transition should be planned. An internal participatory mid-term evaluation should be planned for 2015.

For VDAP

- Review quality and appropriateness of CSAV training. Encourage CSAV to evaluate student preparation and student-participatory program evaluations. Explore broader training/ educational opportunities, especially non-degree medium term (3-6 months) training.
- Encourage English language assessment and possible in-service remedial study for all English-medium training and/or assess English ability and hire translators where needed. Translate training materials as necessary to assure efficient learning.
- Maintain thorough and sex-disaggregated data on training and other activities.
- Explore media-based and distance learning modules to expand access to specific training modules. Videotape demonstrations.
- VDAP should draw on its global experience and credibility to advise GOI on integration of DRR agencies (earthquakes, meteorology, and volcanology) and encourage better coordination with local communities and NGOs to improve awareness and preparedness.
- VDAP might research ways to strengthen Indonesian university programs, perhaps with student and/or researcher exchanges, short-courses, and collaborative research. Exploratory discussions with VDAP, CVGHM and a consortium of Pacific Northwest universities are encouraging.
- VDAP should encourage CVGHM to link volcano monitoring data with international agencies where appropriate.

For USAID/OFDA

- Maintaining records of training provided, equipment donated, success stories and demonstration of increased capacity and lives saved would tell the story of VDAP success. Reports and stories appear in scientific journals, but rarely are they found in development publications. Partner countries' journals and articles that refer to or demonstrate VDAPs role, implicitly or explicitly, should be catalogued and shared.
- Although branding can be taken to excess, and can be politically sensitive, a VDAP logo on donated equipment, or on training materials, software developed, would raise the profile of VDAP.
- Continue focus on DRR and encourage integration of VDAP with USAID/Indonesia DRR activities.
- Share with USAID/Indonesia and the US Embassy VDAP's DRR support activities elsewhere in the world to contribute to mission-wide emergency planning and response.
- Encourage better coordination with the National Disaster Management Agency at the national and local levels and local communities and NGOs to improve awareness and preparedness.

For USGS

- Better administrative support should be given to VDAP in order to free VDAP staff for more attention to their scientific and technical work.
- Encourage the USGS (with USAID/OFDA support) to recruit additional, gender-balanced staff to enlarge the available cadre of highly trained, experienced volcanologists and technical staff qualified to respond to future volcanic crises when so requested by USAID/OFDA. This is needed not only to reduce the workloads and travel requirements for existing staff, but is also critically needed to replace existing VDAP staff as they approach retirement in coming years.
- USAID/OFDA/USGS might look to VDAP's long-term relationship with and technical assistance to Ecuador's Instituto Geofísico as an example of "handing over" project leadership.

For VDAP and CVGHM together

- Provide increased digital storage capability at KKVO and at future regional observatories. The threefold increase of data available through the regional network is more than can be stored at KKVO. VDAP should provide guidance on installing and using this equipment.
- VDAP should encourage CVGHM to eventually replace existing analog-based seismic stations to all-digital instrumentation as opportunities arise. This is especially important for the current VDAP project to upgrade volcano-monitoring capabilities at Java volcanoes and will aid in the integration of other deformation monitoring instrumentation with seismic systems. Additional expenses will be involved initially in making this transition as new telemetry networks may be required, new digital hardware is purchased, and additional training is conducted. Such a transition should be made gradually to ease the adjustment. Although complete conversion to all-digital data acquisition and processing will require several years to implement, the completed system will be more robust, easier to maintain, more compatible with global standards, and will save money in the long run.

Recommendations Java

- More complex monitoring instrumentation should be installed – possibly to include improved deformation monitoring to improve accuracy and speed in data dissemination, thereby increasing the chances to save more lives.
- VDAP should support and training should be given to CVGHM (and/or the Geological Agency) geologists to make detailed geologic maps – with major focus on radiocarbon dating to understand long-term history of hazardous behavior.
- Any training of Indonesian observers, technicians, or volcanologists should include introductory perspectives on broader issues beyond their narrow specialties – to increase their "flexibility" and ability to understand "the bigger picture" of their responsibilities.

Recommendations Merapi

- The Merapi 'model' of broad community inclusion in early warning should be encouraged and applied at all high risk volcanoes. Strong links must be created between community groups, schools, and disaster agencies.
- VDAP should consider providing research/technical input toward designing community action plans based on local hazard characteristics.
- VDAP's style of crisis response is appropriate and should be continued.

7. OTHER CONSIDERATIONS

7.1 What should VDAP do in order to better demonstrate its impact in the future?

VDAPs modus operandi is to work behind the scenes and support host country partners to elevate their stature and credibility. As Harlan Hale put it, "to quietly do good."[20] VDAP's good work is known among volcanology circles, and the link to the Smithsonian Global Volcano Program is a "fringe benefit" according to USAID/OFDA Geoscience Advisor Gari Mayberry, which shares information globally via Smithsonian's "most popular website."

As noted above in Section 6, Recommendations, maintaining records of training provided, equipment donated, success stories and demonstration of increased capacity and lives saved would tell the story of VDAP success. Reports and stories appear in scientific journals, but not in many development publications such as USAID's

[20] Interview USAID Jakarta Oct 1 2012

FRONT LINES or the USAID Development Experience Clearinghouse. Partner countries' journals and articles that refer to or demonstrate VDAPs role, implicitly or explicitly, should be cataloged and shared. Although branding can be taken to excess, and can be politically sensitive, a VDAP logo on donated equipment, or on training materials, software developed, would raise the profile of VDAP.

The team recognizes that the suggestions above would require valuable staff time, and VDAP is already constrained by a very small number of staff positions.

7.2 Independence: "**Where are we on the continuum of nationalization?"**

The GOI recognizes and values VDAP, which is viewed as an ongoing "scientific partnership" according to CVGHM Chief Surono (interview, J. Lockwood, Oct 2012). Although Surono's ambitious planning "Blueprint" for 2014 calls for complete monitoring systems at all PP1 volcanoes, improved capacity for observers, and increased ability to make and procure their own investments by 2014, his message to the evaluation team was: "Please stay in Indonesia to realize the renewal of all instrumentation in Indonesia by 2014, to create the Earth Observatory Indonesia, and to provide more study opportunities in the US." [21] VDAP/USGS realizes benefits from the partnership with Indonesia, including the opportunity for scientific research and partnership, access to Indonesian volcanoes by US scientists, development and testing of new procedures and equipment that is used domestically.

Sustainability is improved with the elevated profile and stature of the CVGHM within the Government of Indonesia. The very public and positive role of CVGHM during the Merapi crisis of 2010 garnered national attention, elevating the role of science and scientists and increasing the likelihood of future cooperation and consultation among government agencies and communities.

VDAP has developed mature partnerships with other countries over many years' involvement. As mentioned in Section 6, Recommendations, USAID/OFDA/USGS might look to VDAP's long-term relationship with and technical assistance to Ecuador's Instituto Geofísico as an example of transitioning project leadership to the host country for long term sustainability.

7.3 Has VDAP had an impact on the larger DRR community in Indonesia and increased the ability of the government to address the issue of DRR?

Since the 2004 Tsunami, the GOI has redirected attention to gaining control of disaster preparedness and response. The CVGHM response to the Merapi Eruption of 2010 was a clear illustration of the crucial role of science and scientists in saving lives.[22] The Bandung Accord is a regional initiative focused on strengthening DRR planning and cooperation in the region. VDAP has demonstrated its support of the principles and encouraged multi-national and regional approaches.

7.4 Should VDAP focus on specific training or broader science education?

While VDAPs intensive individualized ad hoc training is very effective in skills transfer, it assumes staff continuity and is not efficient in terms of cost/session/student. Long-term sustainability and independence depends on broad-based scientific competencies. The CSAV program is broad-based and practical, but doesn't offer any certification, career benefit, even evaluation. While Japan and France offer limited graduate fellowships abroad, VDAP might encourage strengthening Indonesian university programs, perhaps with student and/or researcher exchanges, short-courses, and collaborative research. Exploratory discussions with VDAP, CVGHM and a consortium of Pacific Northwest universities are encouraging.

7.5 What are some unmet needs/gaps?

- Both VDAP and CVGHM would benefit from more and better monitoring and evaluation. A collaborative process of goal-setting, determination of useful indicators and benchmarks, and regular internal review would deepen collaboration beyond the present level of personality-driven planning

[21] Presentation CCVGHM Oct 2012

[22] Dr. Chris Newhall, interview Jakarta Sept 2012

and execution to broader institutional collaboration. USAID's Evaluation Policy and new approaches to evaluation of humanitarian action offer useful structure and rigor, and means to apply findings to program adjustments.

- VDAP should continue to encourage better integration of DRR GOI government services, especially in the areas of ash risk, civil aviation and meteorology.
- Early Warning: VDAP can work with CVGHM and others to streamline and consolidate the flow of early warning information. Cooperation with BNPB, community NGOs, earthquake and tsunami warning systems can save lives.
- USAID/OFDA/USGS with the GOI should consider placing a VDAP "advisor" at CVGHM to establish program monitoring and evaluation; plan, provide, evaluate and reinforce training; improve coordination with other donors and capacity within GOI; and facilitate rapid response. The initiative for such a position must come from GOI, however, and would be transitional, with a view to withdrawal after a determined time frame.

Annexes

ANNEX A: EVALUATION SCOPE OF WORK

PURPOSE

The purpose of task order is to conduct an evaluation of the joint USAID/USGS Volcano Disaster Assistance Program (VDAP) http://volcanoes.usgs.gov/vdap/) in Indonesia since 2004. The contractor shall provide technical and advisory services, and team leadership to USAID's Office of Foreign Disaster Assistance, in conducting an evaluation of the following:

1) a capacity-building project conducted in North Sulawesi, Indonesia between 2004 and 2010, to improve volcano monitoring at 10 active volcanoes;
2) a similar program that began in FY 2010 in Java and will continue for several years;
3) VDAP's emergency response to the eruptions of Merapi volcano on Java in 2006 and 2010. The results of this evaluation will be instrumental in improving VDAP programming and determining appropriate future funding levels.

BACKGROUND

Since 1980, volcanic activity has killed more than 29,000 people globally and displaced more than 1 million others. With more than 1,500 potentially active volcanoes worldwide, an average of 10 eruptions a year cause significant damage and casualties, while major volcanic events occur several times a decade.

Following the disastrous eruption of the Nevado del Ruiz volcano in Colombia in 1985 which resulted in approximately 23,000 deaths, the United Stated Geological Survey (USGS) and USAID's Office of Foreign Disaster Assistance (OFDA) developed VDAP to respond to international volcanic events.

Co-funded by both agencies, VDAP has provided technical assistance to national volcano monitoring organizations since 1986. VDAP provides the only international rapid-response volcano crisis team in the world and its goal is to minimize the damage resulting from major volcanic events. VDAP contributes to the enhancement of risk reduction and response capacity in developing countries through the donation of volcano-monitoring equipment to local volcano observatory staff to track changes at volcanoes, developing early warning plans and monitoring technology, and providing hazard assessment training.

In addition to emergency responses, VDAP also supports capacity building programs in many countries, mainly in East Asia and the Pacific and Latin America and the Caribbean, where many of the most potentially deadly volcanoes are located. To date, VDAP has responded to 26 major crises and worked to build capacity in 12 countries, helping to save lives and protect property.

Indonesia is the world's most volcanically active nation, with over 100 potentially active volcanoes, numerous eruptions each year, and several million people living directly on the flanks of volcanoes. It also has the world's largest population at risk from volcanic hazards with
3.3 million people living within 10 km of active volcanoes.

VDAP began to provide significant assistance to the Indonesian government's Center For Volcanology and Geological Hazard Mitigation (CVGHM) in 2004 to help them build a new regional volcano observatory in the North Sulawesi region. Over six years, VDAP and CVGHM built a volcano monitoring network with real-time seismic monitoring at the 10 active volcanoes in North Sulawesi and the Sangihe Islands with data relayed in real-time by satellite to Bandung where CVGHM's headquarters is located. In FY 2010, VDAP began a similar capacity-building project focusing on eight of the most hazardous and least monitored volcanoes on Java.

In 2006, VDAP sent a 4-person team to assist CVGHM during an eruption of Merapi volcano on Java. Merapi is one of Indonesia's deadliest volcanoes and eruptions directly threaten more than 100,000 people living nearby. In 2010, Merapi erupted again and produced one of the largest eruptions at the volcano in over 100 years. VDAP sent a 3-person team to assist CVGHM with monitoring data analysis and eruption forecasting. In addition to the Merapi responses, VDAP has provided emergency assistance for several other volcanoes in Indonesia (See Appendix for details).

Evaluation Objectives and Critical Questions This evaluation shall address the following questions: *Overall Performance & Impact:*

What is the overall performance and impact of the USAID/OFDA-funded VDAP capacity building activities in Indonesia (North Sulawesi and Java) and VDAP emergency responses to the eruptions of Merapi in 2006 and 2010?

To what extent were the stated strategic objectives of VDAP achieved? What were the major issues influencing the achievement or non-achievement of the objectives?

What are the most significant impacts that VDAP capacity building activities in Indonesia have had on both direct and indirect beneficiaries since 2004?

Has the ability of the Indonesian authorities to forecast and respond to eruptions improved as a result of VDAP assistance?

What are the number of lives and amount of property saved in part due to VDAP assistance?

Is VDAP assistance cost effective and how has it impacted the economies where they have worked (e.g., value of preservation of livelihoods)?

How much USG money was saved due to timely evacuations as a result of VDAP assistance that would normally have been spent on disaster response?

Efficiency:

Was the VDAP programming in Indonesia efficient?

Was the VDAP program cost effective? Timely?

Were VDAP activities well-coordinated with other donors to avoid duplication of effort?

Coverage and Design:

Assess the appropriateness and success of VDAP coverage and capacity program design in Indonesia.

Has VDAP coverage or reach (i.e., identification and training of direct beneficiaries for capacity building) proved to be optimal?

Are there any discrepancies between various beneficiary groups particularly where one group may or may not have disproportionally benefitted as compared to another?

Sustainability:

Are the VDAP capacity building activities in Indonesia sustainable?

What evidence is there that key technical capacity, skills, and behavior changes as a result of VDAP capacity building have been retained in North Sulawesi? What is the likelihood of their sustainability?

What assumptions and/or challenges related to the policy and enabling environment of Indonesia will likely affect sustainability?

Gender Equality and Equity:

Did VDAP projects ensure the involvement of women and assist men and women equally?

To what extent has/does VDAP prioritize and pursue gender equity (i.e., equal access to VDAP deliverables and services)?

Did the VDAP program make efforts to encourage and/or facilitate women's involvement in its capacity-building activities?

What additional steps might VDAP undertake to improve gender equity and equality?

Methodology

The successful offeror shall submit a detailed draft evaluation design and methodology; however, it is anticipated that the final methodology will be developed collaboratively between the proposed evaluation team and USAID/OFDA technical and regional program staff in Indonesia and Washington, DC.

In order to ensure the maximum value for learning and use, a description of the proposed evaluation methodology should include, at a minimum:

1. Evaluation study design (e.g., pre and post-test comparative cross-sectional descriptive study, pre and post-test with a control group, time series, other panel design, or other).

2. How it will be determined which evaluation methods and outcomes can be applied to this evaluation. Upon initiation of the contract work, and once the contractor has the required information, they will be expected to make a recommendation as whether this evaluation should be an impact evaluation or a performance evaluation, as delineated in the USAID's Evaluation Policy manual [http://www.usaid.gov/evaluation/USAIDEvaluationPolicy.pdf (page 8)]

According to this policy, impact evaluations are based on models of cause and effect and require a credible and rigorously defined counterfactual to control for factors other than the intervention that might account for the observed change.

Performance evaluations, however, focus on descriptive and normative questions: what a particular project or program has achieved (either at an intermediate point in execution or at the conclusion of an implementation period); how it is being implemented; how it is perceived and valued; whether expected results are occurring; and other questions that are pertinent to program design, management and operational decision making. Performance evaluations often incorporate before-after comparisons, but generally lack a rigorously defined counterfactual.
This evaluation can be either an impact or performance evaluation based on determination of the contractor. This determination will be discussed during the kick-off meeting.

3. Methods of data collection (e.g., statistically representative quantitative data collection using a household survey questionnaire, use of defined counterfactuals including control and treatment groups, convenience sample of selected communities and groups using qualitative interview guides, or other).

4. Plans for analysis (e.g., identify variables for a test of statistical correlation, matched controls, regression analysis to account for confounding variables, etc.)

5. Measures and plans undertaken in order to ensure protection and confidentiality during data collection

Evaluation Study Design

The following focus activities/programs for the evaluation have been identified:

1) The North Sulawesi program, which recently ended;
2) The VDAP program in Java, which is currently underway;
3) VDAP response to the Merapi eruption in 2006; and
4) VDAP response to the Merapi eruption in 2010.

Given the nature of the VDAP intervention design and the identification of programs that reflect different stages in implementation and anticipated outcomes, it is anticipated that an evaluation study design will include a combination of qualitative data analysis with time-bound descriptive qualitative data. In describing the evaluation study design, applicants are expected to justify the selection and application of methods.

The proposed evaluation designs may include but are not limited to a comparison between this USAID/OFDA-funded VDAP with results from similar assistance funded by other donors in other parts of Indonesia.

Data Collection Methods

It is anticipated that the evaluation will include qualitative and quantitative data collection from a representative sample (or a convenience sample, if justification and selection criteria are provided) of VDAP programming. Proposals should include a description of specific data collection methods, an outline of data collection tools to be developed (including a description of how such tools will be developed and with whom), and a scope and time-line for data collection.

Examples of qualitative data collection appropriate to the VDAP evaluation shall include (but are not limited to) the following:

Structured individual or focus group interviews with end-users or the general population (as beneficiaries of effective application of VDAP training), through an appreciative inquiry approach or other method.
Structured interviews with VDAP trainees, their supervisors, and stakeholders who rely on communication or technical direction from VDAP trainees.

Examples of quantitative data collection shall include (but are not limited to) the following: Observation checklists designed to rank, score, or rate VDAP trainees' demonstration of skills in realizing specific technical tasks related to VDAP training (e.g., proper installation and maintenance of equipment, interpreting data, and making forecasts);
Assessment and quality/effectiveness ranking lists of reports, communications, and other documents generated as a result of VDAP trainees' practices in installation and maintenance of equipment, data interpreting, and eruption forecasting; and

Tools to capture various quantitative variables that reflect the success or failure of specific aspects of the Merapi eruptions in 2006 and 2010.

Although ideal baseline data for pre-/post-intervention comparison may not be available, data related to how CVGHM dealt with eruptions in North Sulawesi and the Sangihe Islands before and after VDAP's capacity building project will likely be useful in determining changes in key outcome variables, such as adequate forecasting, appropriate communication of hazards to USAID's counterparts about imminent or potential volcanic eruptions, etc. Similarly, comparisons between CVGHM responses at Merapi before and after VDAP assistance will provide useful baseline information (see Attachment J.4 for details about past eruptions).

Data Analysis

Proposals shall provide plans for the analysis of all qualitative and quantitative data collected. Analysis of quantitative data that includes tests for statistical correlation between the following quantitative variables could prove valuable to the evaluation:

1) Skills that VDAP trainees were taught;
2) VDAP trainees' practice/behaviors (i.e., application of skills taught) related to proper equipment installation and maintenance, data interpretation, forecasting, and other communication; and
3) Other quantifiable factors, such as number of training contact hours, presence/absence of a mentor, number of real-world application opportunities, how much time since most recent VDAP training, VDAP follow-up support, remote assistance, etc.

Qualitative data should be analyzed appropriately and a recognition of the value of rich, ethnographic and descriptive personal and perceptual data evident in the analytical approach outlined in the proposal.

The analysis should identify any barriers or constraints to adaptation and application of VDAP training—i.e., technical analysis, communication, and application of seismic and volcanology data—as well as unanticipated circumstances (e.g., political or policy environment changes, natural disasters of an enormous scale, etc.) that could skew the outcomes positively or negatively.

Activities/Deliverables (please reference Section F.2 – Deliverables)

Draft Work Plan and Draft Inception Report

The work plan must include the anticipated schedule and logistical arrangements and delineate the roles and responsibilities of members of the evaluation team. Any revision to the work plan must be submitted to the COR.

Kick-off Meeting (Washington, D.C.):

An initial kick-off meeting will held in Washington, D.C. to review the draft Inception Report and draft Work Plan. The evaluation team shall meet with staff from USAID/OFDA, USGS, and other knowledgeable parties. The contractor shall also include strategic assessments, grant documents, situation reports, and other relevant documents. The USAID-USGS Geoscience Advisor will assist with the facilitation of meetings and procurement of documents, as necessary.

The Kick-off meeting shall be held not later than 14 days after the award of the contract. Members from the Indonesia Mission may be in attendance via teleconference; therefore all materials must be presented to the COR prior to this meeting. The Work Plan and Final Inception Report (Evaluation Design) shall be submitted 7 days hence.

Final Inception Report (Evaluation Design)

The Evaluation Design will include a detailed evaluation design matrix (including key questions, and the methods and data sources used to address each question), draft questionnaires and other data collection instruments, known limitations to the evaluation design, and the final work plan. The final Design shall be approved by the COR prior to departure for Indonesia to conduct field work and data collection.

Kick-off Meeting (Indonesia Mission):

The evaluation team will meet with USAID/Indonesia upon arrival in Jakarta to brief the country team as to the evaluation in-country methodology and coordinate logistical/administrative arrangements. The duration of the field work and data collection in Indonesia may last up to 30 days.

The duration of the visit may involve, but is not limited to, meeting with representatives of the U.S. Government, Indonesian Government, other donors, international NGOs, local NGOs, UN organizations, and other relevant agencies in North Sulawesi, Jakarta, and other sites in Java.

Systemic data collection of trained data collection exerts should also take place during this period.

Presentation of Preliminary Findings and Recommendations (Indonesia Mission):

After conclusion of the Evaluation, the team shall provide an oral briefing of its findings and recommendations to the relevant USAID/Indonesia management prior to leaving Indonesia. The Washington DC team will be joining this meeting via conference call, therefore all documentation (i.e. PowerPoint slides) must be submitted prior to the meeting.

Presentation of Draft VDAP Evaluation Report (Washington, D.C).

The team will also provide an oral briefing of the Draft VDAP Evaluations Report to USAID in Washington, DC, although USAID/Indonesia will be joining this meeting via conference call; therefore, therefore all documentation (i.e. PowerPoint slides, etc.) must be submitted to the COR prior to the meeting commencement.

Draft VDAP Evaluation Report

Findings from the evaluation will be presented in a draft report at a full briefing in Washington, D.C. with USAID/OFDA, USAID/Indonesia, and possibly key stakeholders. Time allotted for preparing a DRAFT written report is 10 days.

Final VDAP Evaluation Report

The Final *VDAP Evaluation* Report will be provided to USAID/OFDA in electronic form within 15 days following receipt of comments from USAID. The report shall include an executive summary and shall not exceed 50 pages (excluding appendices). The executive summary shall be 3-5 pages in length and summarize the purpose, background of the project being evaluated, main evaluation questions, methods, findings, conclusions, and recommendations and lessons learned (if applicable).

Following the final oral briefings and taking into account any new information obtained and feedback provided, the evaluation team will prepare and print a final bound version of the evaluation report and submit it in hard copy and electronic form to the COR identified in Section G.2.

The final *VDAP* evaluation report shall contain the following:

1. Executive Summary
2. Table of Contents

3. Introductions (purpose, audience, synopsis—one page)
4. Methodology (i.e., data collection, analysis, selection criteria/ sampling, constraints /limitations)
5. Analysis/Results (e.g., an objective accounting of an analysis of the data)
6. Findings and Conclusions
7. Recommendations
8. References (include all documents reviewed, including background documentation and records of technical data application and decision-making)
9. Annexes (these may include: the Statement of Work; any 'statements of difference regarding significant unresolved difference of opinion by funders, implementers, and/or members of the evaluation team; all tools used in conducting the evaluation, such as questionnaires, checklists, survey instruments, and discussion guides; sources of information, properly identified and listed; disclosure of conflicts of interest forms for all evaluation team members, either attesting to a lack of conflict of interest or describing existing conflict of interest

Furthermore, the report shall meet the following criteria as stated in USAID's Evaluation Policy Guide (http://www.usaid.gov/evaluation/USAIDEvaluationPolicy.pdf):

The evaluation report should represent a thoughtful, well-researched and well organized effort to objectively evaluate what worked in the project, what did not and why.

The evaluation report should address all evaluation questions included in the scope of work the scope of work, whether in technical requirements, evaluation questions, evaluation team composition, methodology or timeline shall be agreed upon in writing by USAID/OFDA.

Evaluation methodology shall be explained in detail and all tools used in conducting the evaluation such as questionnaires, checklists and discussion guides will be included in an Annex to the final report.

Evaluation findings will assess outcomes and impacts using gender disaggregated data. Limitations to the evaluation shall be disclosed in the report, with particular attention to the limitations associated with the evaluation methodology (selection bias, recall bias, unobservable differences between comparator groups, etc.).

Evaluation findings should be presented as analyzed facts, evidence and data and not based on anecdotes, hearsay or the compilation of people's opinions.

Findings should be specific, concise and supported by strong quantitative or qualitative evidence.

Sources of information need to be properly identified and listed in an Annex, including a list of all individuals interviewed.

Recommendations need to be supported by a specific set of findings. Recommendations should be action-oriented, practical and specific, with defined responsibility for the action.

ANNEX B: MATRIX OF KEY QUESTIONS AND TOOLS

Key evaluation questions	CB[23]	R	Methods	Data sources	Sample interview questions
I.– Overall Performance & Impact:					
A. What is the overall performance and impact of the USAID/OFDA-funded VDAP capacity building activities in Indonesia (North Sulawesi and Java) and VDAP emergency responses to the eruptions of Merapi in 2006 and 2010?	X	X	Literature review, content analysis Stakeholder analysis and identification Focus group discussions Structured and semi-structured key informant interviews Surveys and questionnaires Participant observation Strength, Weakness, Opportunities, Challenges Activity Case Studies	Program Quarterly Reports and other documents from CVGHM, and KKVO, and others stakeholders VDAP officers (CVO) USAID, OFDA officers Indonesian government authorities including high ranking officials from Geological Agency, Ministry of Energy and Mineral Resources; National Agency for Disaster Management and CVGHM Other donors (AusAID, IOM, France,) VDAP trainees (CVGHM scientists and technicians, observatory post staff incl. Management and staff both in Bandung, Kakasasen/KKVO, and BPPTK-Yogyakarta) NGOs (DERAP, Jalin Merapi, FPRB) Relevant national and local government agencies at provincial and district/city level (BNPB - Jakarta, BPBD-Yogyakarta province and Tomohon city) Trained technicians Observatory Staff Community groups (at Mt. Merapi)	North Sulawesi and Java Do the activities, priorities, and expertise of VDAP meet appropriate OFDA and Indonesian goals? Are the scientific investigations and research results throughout the VDAP activities effectively integrated and applied to achieve mitigation where it is needed? To what extent the 2004 – 2010 planned activities were implemented (NS/Java)? What are the equipments delivered and in use? Are training specifically designed in response to locally identified needs? Cite evidences of increased capacity in volcano monitoring and hazard response capacity? How does VDAP assistance compare to other donors' assistance? Has VDAP assistance impacted "science for diplomacy?" For Merapi response: What are roles VDAP played in 2006 and 2010 volcano crises? What lessons learnt in 2006 crisis which was relevant 2010 crisis response? What significant differences in Merapi 2006 and 2010, versus VDAP 1995 response and pre1995 Merapi events with no VDAP assistance?
B. To what extent were the stated strategic objectives of VDAP achieved? What were the major issues influencing the achievement or non-achievement of the objectives?	X	X	Literature review, content analysis Individual and group interviews Perception on Training Survey SWOC Activity	Agreements, MOU, and work plans Quarterly reports VDAP management Indonesian government authorities: National Agency for Disaster Management (NADM)	How would you compare the plan at the initial stage of the project with what has been achieved to date? What factors facilitated or hindered the achievement of objectives? In what ways did the experience with the Merapi eruptions and other VDAP capacity-building work help further understanding of volcano forecasting? In what ways did the VDAP assistance during the Merapi and other Indonesian volcano eruptions add value to the CVGHM response?

[23] CB - Capacity Building; R - Response

Key evaluation questions	CB[23]	R	Methods	Data sources	Sample interview questions
				CVGHM (Incl. BPPTK and KKVO) management; and trained scientists and technicians incl.	
C. What are the most significant impacts that VDAP capacity building activities in Indonesia have had on both direct and indirect beneficiaries since 2004?	X		Review of VDAP and CVGHM reports and other program documents Structured individual key informant interviews Focus group interviews Observation	VDAP staff CVGHM staff Ministry of Energy and Mineral Resources- Geology Agency BNPB national and local government levels.	What significant and observable changes in responding crises as a direct result of VDAP inputs? What are the most important things that VDAP has provided and done? What are the major accomplishments of your collaboration with VDAP? What could VDAP have done better? What opportunities are there for future improvements? What are the biggest challenges that you face in volcano hazard monitoring?
D. Has the ability of the Indonesian authorities to forecast and respond to eruptions improved as a result of VDAP assistance?	X	X	Desk review of reports, communications and other program documents Observation Equipment listing at NS and Java volcano monitoring networks (comparison before and after VDAP assistance) Analysis of volcano monitoring data prior to eruptions, with possible comparison group Structured interviews	Program monitoring data/program/quarterly reports Geological mapping and historical studies for volcanoes at North Sulawesi and Sangihe Island before, during and after VDAP support VDAP trainees (technicians and scientists), their supervisors, and stakeholders who rely on communication or technical direction from VDAP trainees. Relevant agencies at the national and local government levels BPPTK – section heads (Merapi Monitoring, technology Development, and Laboratory)	What does VDAP do in emergency response? What was different in disaster response between 2006 and 2010? Since VDAP assistance… How many seismometers have been deployed? How many geodetic survey points have been established? Has donated equipment been regularly and effectively used? Have technicians kept equipment running? How are they maintained? What new instruments have you learnt to install and operate from VDAP support? How does VDAP assistance improved ability to monitor and interpret monitoring data? How has risk reduction planning changed?
E. What are the number of lives and amount of property saved in part due to VDAP assistance?	X	X	Key informant interviews and focus group discussion	USAID/OFDA CVGHM NGOs (FPRB, DERAP, Jalin Merapi) Relevant government agencies involved in coordinated evacuations International relief organisations that provided aid during and after eruptions and have supported livelihood recovery projects in Indonesia and specifically in covered area	For specific eruptions, did VDAP provide information to aid CVGHM in making decisions of recommending evacuations? If so, how timely was the information? Did CVGHM have the appropriate data to determine if evacuations were needed? How many of the population at risk were evacuated? Any social measures for saving livelihood assets
F. Is VDAP assistance cost effective and how has it impacted the economies where they have worked (e.g., value of preservation of livelihoods)?	X	X			
G. How much USG money was saved due to timely evacuations as a result of VDAP assistance that would normally have been spent on disaster response?	X	X			

Key evaluation questions	CB[23]	R	Methods	Data sources	Sample interview questions
II. Efficiency					
Was the VDAP programming in Indonesia efficient?	X	X	Desk review Key informant interviews FGD	CVGHM JICA, France, UN-OCHA, EU Quarterly reports	Are planned activities implemented, What are the results? How could VDAP assistance be more efficient? Was money well spent?
Was the VDAP program cost effective? Timely?	X	X	Compare VDAP programming to other donors' programming	Work Plans Program Budgets	Are there any ways in which the timing of VDAP assistance be improved/cost effective?
Were VDAP activities well-coordinated with other donors to avoid duplication of effort?	X	X			How could coordination with VDAP be improved? How was VDAP remote sensing data (hazard monitoring) used to assist in 06 and 10 decision-making?
III. Coverage and Design (Relevance)					
A. Assess the appropriateness and success of VDAP coverage and capacity program design in Indonesia.	X		Desk review Key informant interviews	USAID/OFDA CVGHM National Agency for Disaster Management Other possible groups to interview: *United Nations Disaster Assessment and Coordination (UNDAC); JICA* List of participants to various capacity building activities.	Was the assistance in line with Indonesian needs and perceptions of priorities? Was coverage sufficient?
B. Has VDAP coverage or reach (i.e., identification and training of direct beneficiaries for capacity building) proved to be optimal?	X				How do you identify participants that will attend VDAP trainings? How is their knowledge shared?
C. Are there any discrepancies between various beneficiary groups particularly where one group may or may not have disproportionally benefitted as compared to another?	X	X			Did the "right" people receive VDAP training? Or should others be prioritised? Were women fairly represented?
IV. Sustainability					
A. Are the VDAP capacity building activities in Indonesia sustainable?	X		Desk review Structured interviews Focus Group Discussion Direct Observation	VDAP training curricula used throughout VDAP assistance period VDAP trainees, their supervisors, subordinates, and stakeholders who rely on communication or technical direction from VDAP trainees. Observatory Staff	How many and what types of training were provided by the program overtime? How are the knowledge and skills acquired from the training made relevant to their work? Cite evidences. Are and how knowledge shared within the institution? How sustainable is the regional network built in North Sulawesi? Likelihood to other regions?
B. What evidence is there that key technical capacity, skills, and behavior changes as a result of VDAP capacity building have been retained in North Sulawesi? What is the likelihood of their sustainability?	X				
V. Gender Equity:					
A. Did VDAP projects ensure the involvement of women and assist men and women equally?	X	X	CVGHM program reports	List of CVGHM staff that received training from VDAP	Who attended what kind of training? When and where?

Key evaluation questions	CB[23]	R	Methods	Data sources	Sample interview questions
To what extent does VDAP prioritize and pursue gender equity (i.e., equal access to VDAP deliverables and services)?			Focus Group Discussion	Indonesian gender policy	Do women and men have equal access and participate in capacity building activities?
B. Did the VDAP program make efforts to encourage and/or facilitate women's involvement in its capacity-building activities?	X		Key informant interviews Focus Group Discussion	Male and Female technicians and scientists CVGHM	Does VDAP set specific requirement on who should participate to training? Does VDAP specifically require proportionate number of women as participants in each training?
C. What additional steps might VDAP undertake to improve gender equity and equality?	X	X	Key informant interviews	CVGHM VDAP	How could VDAP improve gender equity in the support it provides?

ANNEX C: PERSONS INTERVIEWED

US Government

Mark Bartolini, USAID/OFDA Director
Peter Morris, USAID/OFDA Technical Assistance Group Lead
Christine Gottschall, Asia and the Pacific USAID/OFDA Regional Team Lead
Langdon Greenhalgh, USAID/OFDA Monitoring and Evaluation Advisor
Patricia Hampton, USAID/OFDA Disaster Operations Specialist East Asia and the Pacifici
Gari Mayberry, COR, USAID/OFDA-USGS Geoscience Advisor
Harlan Hale, Regional Regional Advisor, USAID/OFDA EAP Indonesia
Yusak Oppusunggu, Program Specialist, Office of Environment, USAID Indonesia
Alfred Nakatsuma, Former Mission Disaster Response Officer, USAID Indonesia

U.S.Geological Survey

David Applegate , Associate Director for Natural Hazards
Ron Keeler, Remote sensing support at USGS Reston, VA
Bill Burton, Remote sensing support at USGS Reston, VA
Charles Mandeville, Coordinator, USGS Volcano HazardsProgram
John Eichelberger, former Coordinator, USGS Volcano HazardsProgram
Steve Brantley, Acting Associate Coordinator, USGS Volcano HazardsProgram **Smithsonian Institution**

Rick Wunderman, Editor, BGVN
Julie Herrick, Contractor, BGVN
Liz Cottrel, Director, GVP
Benjamin Andrews, Curator/Volcanologist
Edward Venzke, Data/Researcher
Sally Kuhn Sennert, USGS-GVP Weekly Volcanic Activity Report Editor

Cascade Volcano Observatory

John Ewert, Director, Cascade Volcano Observatory
John Pallister, Geologist, VDAP Chief
Wendy McCausland, Seismologist, VDAP
Sara Jivanjee, VDAP Administrative
Andy Lockhart, VDAP Geophysicist
Marvin Coachmen, VDAP Physical Science Technician
Angie Diefenbach, VDAP Geologist
Martin Lafevers (Rowdy), VDAP Geophysicist
Jeff Marso, VDAP Geologist
Randy White, VDAP Seismologist
Julie Griswald, VDAP Geologist
William Scott, Volcanologist
Steve Shilling, VDAP Geologist

Alaska Volcano Observatory

Tina Neal, US Geological Survey, Anchorage, AK
David Schneider, VDAP Remote sensing support at the Alaska Volcano Observatory

Other Donors

Jonathan Griffin, Geophysicist, Risk and Vulnerability, Australia-Indonesia Facility for Disaster Reduction.

Chris Newhall, Volcanology group leader, Earth Observatory of Singapore (EOS), Nanyang Technological University, Singapore
Jean Phillipe Metaxian, CVGHM Advisor (France)
Susan Jenkins, the United Kingdom

Government of Indonesia, Ministry of Energy and Mineral Resources, Geological Agency

R. Sukhyar, Chief

BNPB (National Disaster Management Agency), Jakarta

Sugeng Triutomo, Deputy Chief for Prevention and Preparedness

CVGHM, Center for Volcanology and Geological Hazard Mitigation

Surono, Director
Sofie Yusmira Oktane W, Administration Officer
Hendra Gunawan, Head of Volcano Monitoring Western Indonesia Sub-division
Kristianto, Head of Investigations Eastern Indonesia Sub-division
Mas Atje Purbawinata, Former Head of Volcano Monitoring and Investigations Division
Mohammad Hendrasto, M.sc, Head of Volcano Monitoring and Investigations Division
Supriyati Dwi Andreastuti , Head of Evaluation of Geological Hazard Potential
Sofyan Primulyana, Mid-level Geo-Volcanology Researcher
Hetty Triastuty, First-level Earth Researcher
Charles Lius, Lead Engineer for Eastern Province
Anna Mathovanie, Technical Facility Management Staff
Aditya S. Andreas
Hery Kuswandarto
Ahmad Basuki, Mid-level Geo-Seismologist
Tumpal D.S.
M. Nizar Firmansyah
Agoes Loeqman, First-level Earth Researcher
Dali Ahmad, Chief of IT Services
Syegi Lenarahmi Kunrat, Volcano Chemical Analyst
Sucahyo Adi, Geo-volcanologist
Novianti Indrastuti, First-level Earth Researcher
Oktory Prambada
Hartati

JAVA Volcano Observatory Posts

Tangkuban Perahu Volcano Observatory Post:
Ilham Mardikayanta
Johan Kusuma
Guntur Volcano Observatory Post:
Wardiman
Ade Koswara
Aam Mahmud
Ciremai Volcano Observatory Post:
IyusRushana
DidiSuryadi
Sukirman
Slamet Volcano Observatory Post:
Sukadi
Sudrajat
LuruhNurcholis

BPPTK, Center for Volcanic Investigation and Technological Development, Yogyakarta

Subandriyo, Head of BPPTK Yogyakarta
IGM Made Nandaka, Head of Division of Development Technology
Sri Sumantri, Head of Development Technology Division
Sri Subandrini, Head of Laboratory Division
Anton Sulistianto, Development of Technology Division Staff
Sulistiyani, Merapi Monitoring Division (Lahar Monitoring) Staff
Isa NurNusanto, Development of Technology Division Staff
Kusdaryanto, Development of Technology Division Staff
Sri Punomo, Bupati, Slamet, Yogyakarta,

MERAPI Volcano Observatory Post

Heru, Kaliurang, Merapi Volcano Observer Post

IOM Yogyakarta

Diana Setiawati, National Project Manager
Yohan Rahmat Santosa, Community Resilience Supervisor
Fachrul Rizky, Community Resilience – Knowledge Management & GIS Focus

BPBD, Disaster Management Agency – Province Level, D.I. Yogyakarta

Gatot Saptadi, Chief

Merapi Information Network, Combine Institute, COMBINE Institute

Nieke Jahya, Director, COMBINE Institute
Mart Widarto, Program Coordinator, Merapi Information Network

Red Cross Pakem Sub-district, Sleman

Suranto, Chief
Sahlan Hasbi
Tri Tukijo
Warsimin
Agung S
Wahyu Dwihantoro

MERAPI Survivor, Petung, Kepuharjo, Cangkringan, Sleman

Kotel Suyamto,
Wongso

FPRB, Disaster Risk Reduction Forum, D.I. Yogyakarta

Rinto Andriono,DRR Forum
Banu Subagyo, DRR Forum
Aries Susanto, DRR Forum
Dini Isnaeni, DRR Forum
Juli E. Nugroho, DRR Forum
Danang Samsu, BPBD D.I. Yogyakarta
Puji Santosa, LINGKAR
Untung Tri W., LINGKAR
Umi Azizah, PALUMA

Telemetry Unit of Search and Rescue (DERAP), D.I. Yogyakarta

Brotoseno, Head of Search and Rescue D.I. Yogyakarta

Ibnu Gerindra, Telemetry Unit Coordinator
DR. Budi Eka Nurcahya. Seismologist/Researcher, Faculty of Mathematics and Natural Science, Gadjah Mada University

KAKASKASEN Regional Volcano Observatory

Mahawu Volcano Observatory Post:
Djuhdi Djuhara
Jemmy Runtuwene

Lokon-Empung Volcano Observatory Post:
Farid Ruskanda Bina
Suwarno
Ferry Rusmawan

Tangkoko Volcano Observatory Post:
Dany F. Porawauw
Yapi F.A. Romboi

Karangetang Volcano Observatory Post:
Daniel Hinandaleng
Didi W.P. Bina
Yudia PramaTatipang

Soputan Volcano Observatory Post:
Sandy Maningkae
Asep Syaifulloh
Fandy Rumimper

BPBD, Disaster Management Agency – District Level, Tomohon, South Sulawesi

Roy Ambro, Head of BPBD Tomohon
William Runtukahu, Head of Division Mitigation and Preparedness
Franitulu, Head of Division Rehabilitation and Reconstruction

ANNEX D: ERUPTIVE HISTORY

VDAP Crisis Response in Indonesia – 2004 – 2012										
Volcano	Location	Date of unrest	Level of unrest	When VDAP involved?	How VDAP involved?	# population at risk	# population evacuated	# deaths	# livelihoods lost	Impact
Awu	Sangihe Islands	2004	PP1 : Hot gas, pyroclastic flow, 2004 : lava dome formation. Population from 3 kilo	Post-eruption	On site response & consultation; 2 seismic – 1 up-grade, 1 new. 2004: Prior to VDAP involvement, Awu crisis > VDAP gave seismic monitoring equipment. VDAP provides interpreted satellite images.					Equipment provided radically improved forecasting abilities; Spurred the start of the NS network.
Merapi	Central Java	2006	PP1 : increasing vulcanic quakes from June 2005; Lava done growth from 26 Apr 06-14 Jun 06 > pyroclastic flow to 7km.	beginning of crisis	Provided 4 tiltmeters in 2005 (and previously in 1990's); 2006: provided Earthworm computer base stn for real-time seismic data analysis; Event probability tree completed with BPPTK to assess hazards/risks; analyzed geochemistry of pyroclastic flow with BPPTK scientists post eruption	1.1 million	20,080	2	12,000 homeless	EARTHWORM software improved seismic analysis; Collaboration on probability trees assisting in predicting the level of risk
Karangetang	Sangihe Islands	2007	continual unrest. Frequent pyroclastic flows.	Post-eruption	Sent seismic and telemetry stations which were installed by CVGHM staff and allowed monitoring from KKVO. VDAP sent remote sensing data and in 2008 started the North Sulawesi networking project.	40,000	500			VDAP strengthens the system > local staff very able to use them efficiently, strategically, capablely
Gamkanora	Halmahera	2007	PP1 : lava flow, ash emission	Post-eruption	14 July request for assistance: System monitoring up-grading, 1 new seismic station plus remote sensing information.		10,000 self-evacuated			Strengthens analysis ability of staff and collaboration with CVGHM
Slamet	West Java	2009	PP? :	During eruption	VDAP team already in Bandung. CVGHM requested they examine seismic records, interpret data for forecast. Result = unlikely explosive eruption proved to be true	no disaster plan at all. BPBD learned lessons from Merapi 2010 but still has no mitigation or evacuation plan. Community created Forum Slamet to prepare for evacuations.	0	0	0	VDAP staff instructed CVGHM seismologists how to read the data, determine depth of magma, and forecast the type of eruption.
Merapi	Central Java	2010	PP1 :	During eruption	Provided remote sensing data after local eruption destroyed instruments except 1. **After**: provided AFM for monitoring lahar.	1.1 million	320000	353	Rp 3,62 trillion in damages	VDAP data directly led to extended evacuation zone to 20 kms and saved over 10,000 lives. VDAP provided 4 AFM that have been reproduced by BPPTK to 14 and placed in each river feeding from the summit. BPPTK is said to have the most advanced lahar monitoring station in the world.

VDAP Crisis Response in Indonesia – 2004 – 2012

Volcano	Location	Date of unrest	Level of unrest	When VDAP involved?	How VDAP involved?	# population at risk	# population evacuated	# deaths	# livelihoods lost	Impact
Sinabung	North Sumatra	2010	rise status from B to A type	During eruption	CVGHM: No monitoring equipment at Sinabung. Moved 2-3 seismic stations from Tangkuban Perahu; VDAP QR: sent three seismic field stations, a base station, radio telemetry gear, and data acquisition and processing hardware and software		25000			Previously unmonitored, assumed dormant volcano awakes > change in monitoring priority. VDAP provided equipment to start observing this mountain.
Sinabung	North Sumatra	2011	PP1 : increased seismicity	During eruption	provided remote consultation on renewed seismicity					
Soputan	North Sulawesi	2011	PP1 : increased seismicity, eruption, ash cloud, pyroclastic flow.	During eruption	In support of the CVGHM response, the VDAP team provided remote sensing data and assistance in interpretation of the seismicity	94,000, Manado city, airport.			ash cloud required airport closure and reroutes for 1 day. Rock miners on west slope unable to work.	Unique eruption patterns studied by VDAP > Five eruptions in past six years with only short-duration precursory seismicity, requires especially careful and diligent monitoring to be able to issue timely warnings. As a consequence of VDAP training, CVGHM closely monitors.
Lokon	North Sulawesi	2011	PP1 : explosion with ash and steam plumes	During eruption	VDAP was in close contact with CVGHM throughout the activity, assisting with interpretation of the activity (prolonged periods of volcanic tremor). VDAP recognized the tremor was caused by boiling of groundwater below the vent and forecast that eruptions would be relatively small, as they were.	28,000 less than 5 km; 120,000 w/in 10 km. International airport at Manado, pop. 400,000, (located 10-20 km north of the volcano)	5,000			VDAP interpretative assistance was important in diminishing concerns that there might be a larger explosive eruption.
Karangetang	North Sulawesi	2011-2012	Ongoing high unrest and hazards to local communities. Frequent pyroclastic flows.	continuously	VDAP maintains regular remote sensing, providing weekly to monthly updates to CVGHM concerning changes at the summit vents and the direction of lava and pyroclastic flows that post the greatest hazards.	40,000				
Ijen	East Java	2011-2012	potential hazard from large and highly acidic crater lake (pH=0). 18 Dec 2011 = increased seismicity and change in lake color		VDAP consulted remotely with CVGHM throughout the crisis, helping with interpretation of the seismicity, evaluation of hazards, modeling of areas subject to potential inundation in the case of a crater lake breakout, and providing remote sensing monitoring of the lake level and emissions.	1.5 million (Banyuwangi) plus villages				Part of VDAP's new up-grading project in Java. VDAP arrangements with Belgian colleagues at Ijen to share seismic data, resulting in multi-lateral partnership between Indonesian team at Ijen, VDAP and Belgian team, with a focus on utilizing all the available data in forecasting activity and assessing hazards.

PP: prioritas pemantauan = monitoring priority is based on likelihood of eruption in relation to population at risk

Table of Volcanic Crisis Response in North Sulawesi and Sangihe Islands since 1986

	Lokon Empung volcano, North Sulawesi	Soputan volcano, North Sulawesi,	Ruang volcano, Sangihe Islands,	Karangetang volcano, Sangihe Islands	Awu volcano, Sangihe Islands
1986					
1987					
1988					
1989					
1990					
1991					
1992					
1993					
1994					
1995					
1996					
1997					
1998					
1999					
2000					
2001					
2002					
2003					
2004					
2005					
2006					
2007					
2008					
2009					
2010					
2011					
2012					
Type of volcano	A/PP1 : urban (Tomohon, Kakaskasen District) 3 kilo distance	A/PP1 : urban. Lava dome formation > eruption and hot gas > continuous dome formation. Nearest city: Amurang Nearest community: 8 kilo	? : Tagulandang Island 1 kilo	A/PP1 : Constant eruption, lava flow, pyroclastic flow. Two craters 3 kilo from crater.	A/PP1 : Hot gas, pyroclastic flow, 2004 : lava dome formation. Population from 3 kilo
VDAP involvement	VDAP was not directly involved in these crises. Instruments and training provided that enable Indonesian monitors to forecast accurately and timely. VDAP assists with post eruption information and analysis regarding lava flow distribution, eruption production.				VDAP had initial response team, helped with interpretation, provided equipment and remote sensing as eruption escalated
	5 seismic stations – all from VDAP (2 up-graded, 3 new) Early warning system from VDAP very effective> monthly eruptions forecasted to Pemda > no deaths.	2 seismic stations – 1 up graded, 1 new. Early warning system from VDAP very effective> monthly eruptions forecasted to Pemda > no deaths.	1 seismic station up-grade, 1 repeater. Early warning system from VDAP very effective> monthly eruptions forecasted to Pemda > no deaths.	1 seismic stn up-grade, 1 repeater at south crater but north crater active since 2010 and no monitors. (requested 3 more) Population lives around the volcano, early warning seismic level reveals type of eruption. Warning from local monitors through village head	2 seismic – 1 up-grade, 1 new. 2004: Prior to VDAP involvement, Awu crisis > VDAP gave seismic monitoring equipment > radically improved forecasting abilities
# population at risk	123,408	5 kilos no residents; 94,000 downwind vulnerable to ash and lahars; high aviation risk 5 kilo		17156	18648
# evacuated	2011 = 6000				
# deaths				2010: 4 missing; dome collapse	

Merapi Eruptive History since 1986					
Dates	**2010: Oct 26-Nov 22**	**2008: 19 May.**	**2006: Mar – 2007: Aug**	**1992: Jan 20- 2002: Oct 19**	**1986: Oct 10- 1990: Aug**
Type of eruption	"100 year eruption; pyroclastic flow to 13 km. Hot gas to 15 kilos."		A new lava dome was built on top of the lava dome of 1998-2001, powerful pyroclastic flows descended the SW, S and SE flanks in late May and June.	Observers in Ngepos and Babadan posts reported an incandescent avalanche on **January 20, 1992. January 31, 1992**: a team climbed the summit and saw a new rounded dome in northeastern part of the crater behind that of 1986. Explosion started in **February 2** at 16.05, preceded by several small pyroclastic flows. It produced an ash column of 2.6 km high and was accompanied by a pyroclastic flow of 4.5 km long in Sat river. Dome formation until July 1993. **1994**: A major collapse of the growing lava dome on **November 22 1994** produced a large pyroclastic flow that ran 7.5 km on the S flank, overrunning Kaliurang	**October 10, 1986** pyroclastic flows occurred with no seismic precursors. For 5 days, pyroclastic flows continued. **October 15, 1986**, the dome grew through 1987. Between October 1986 and January 1987, deformation with an average flux of lava was about 15.000 m3/day. After February 1987, upper part of the dome grew to a volume estimated at 2.5 million m3. **1990**, seismic events increased leading to a swarm of 200 VB and a gas column of 1 km high. **1991:** almost all types of Merapi earthquakes occurred: VA, VB, LF and tremor, culminating in **September 1991** without any important volcanic activity. From **October 1991 to January 1992**, the number of earthquakes lessened.
VDAP involvement	VDAP invited 7 Nov – after eruption. Prior to eruption provided remote sensing visuals that measured radically increasing magma ascent; post eruption geochemistry analysis w/ Dr Andreastuti: product of emmision showed different patterns but geochemistry same. Provide equipment for lahar monitoring (4 AFM) – Boyong, Kalikuning, Gendol, Kali Krasak – heading south – risk areas >Jogja		Diverted from work in N Sulawesi> installed new seismic processing system 'earthworm' equipment w/ local technicians, developed a probabilistic event tree for informing decisions on likely course of the eruption and requirements for evacuations. C Newhall asked to help analyze direction of dome collapse > NASA photo showed to the SE > evacuation. Newhall requested to stay and advise OFDA DART team EQ analysis.	??	??
# Fatalities	386 - 50% from disaster; 50% from evacuation.		2	1994: 66	
# Damages (land, property)	Rp 3,62 trillion: killed over 1,000 livestock, destroyed over 1,000 hectares of productive farming fields: 1,400 hectares of snake fruit in Sleman (est=US$15.5 million), destroyed 700 hectares of vegetable crops, 347 hectares of coffee and coconut plantations, 170 hectares of rice fields.				
# Evacuated	320000		20,212 people (16,377 in central Java, 3,835 in Yogyakarta) were internally displaced	1994: 6000	
Notes	Chris Newhall – 2010 Merapi "one of the all time big successes of volcano hazard mitigation".	No information found	difficult to assess volcanic damage as the earthquake was far more destructive and most aid work and evaluations of damage were focused on the quake on 27 May.		No reported impact on populated areas

ANNEX E: TABLE OF TRAININGS CONDUCTED

Date/Year	Item/Topic	No. of Participants	Place Conducted
CSAV Study			
1997 - 2003	Study at CSAV	8 (7 men, 1 woman)	Hawai'i
2008 - 2012	Study at CSAV	10 (9 men, 1 woman)	Hawai'i
Training at CVO			
Sept. 2005	Seismograph, EARTHWORM and lahar modeling (LAHARZ)	2 (both men)	CVO-WA, USA
September 2009	Visit to CVO and AVO	2 (both men)	CVO,VA-WA and AVO - Alaska USA
From 10 May 2010 for 2 weeks	Analog and Seismic Telemetry	5 (3 men, 2 women) Indonesian Field Engineers	CVO – WA, USA
17 September - 3 October 2010 (2 weeks)	McVCO Installation	4 CVGHM technicians	CVO-WA, USA
From 9 Sept-2012 for 2 weeks	Field Camp for Indonesian geologists	4 geologist (all men)	CVO-WA, USA
20 Sept. – 5 October 2012	Volcano monitoring system and hazard assessment at CVO and AVO, Cooperation evaluation and discussion of 2013 – 2014 work plan, and visit to VAAC.	2 (both men)	CVO,VA-WA and AVO - Alaska USA
Formal Training and Workshops			
23 - 27 Feb 2009	Remote Sensing and Debris Flow Modeling	24 (12 men, 12 women)	CVGHM-Bandung
3 - 4 March 2010	Seismology	CVGHM seismologists, geologists and management	CVGHM-Bandung
27 - 28 March 2009	Introduction to Software Tools for Volcano Seismology	CVGHM staff and management	CVGHM-Bandung
From 15 Feb 2012 for 2 weeks	Seismic Electronic	9 (7 men, 2 women)	CVGHM-Bandung

Earth Observatory of Singapore			
3 - 7 March 2010	Remote Sensing and GIS Modeling at Volcanoes	18 (11 men, 7 women)	Earth Observatory of Singapore, NTU
One – on – one Training and Consultations			
September 2004	Crisis response, seismic and EARTHWORM installation at Awu Volcano	Not available	Mt. Awu, NS
2006	Lahar modeling with LAHARZ software	Not available	Mt. Klabat, NS
2006	EARTHWORM installation	Not available	Mt. Merapi, Yogyakarta
2009	EARTHWORM installation at Kakaskasen main station (KKVO), with small workshop to enable instrument repairs in the observatory post	3 (2 mean, 1 woman)	KKVO-Tomohon
2009, for one week	Seismology	Ijen and Raung volcano observers and CVGHM – Bandung staff	Ijen Observatory Post
February – March 2007	Training on EARTHWORM by Seth Moran	4 (all men)	KKVO Tomohon
February – March 2008	Training on EARTHWORM	CVGHM Staff	KKVO Tomohon
2008	Installation and Training Telemetry System Analog	3 (all male)	Not available
20 - 21 February 2008	Seismic instruments, EARTHWORM, and seismic data interpretation	Not available	Bandung
February – March 2007	Seimic equipment installation at Mt. Lokon, Soputan, Mahawu, and Tangkoko	Not available	NS
March 2009	Replacement of VCO with MCVCO component at Mt Mahawu and Lokon	Not available	NS
2009	Installation of GPS at Mt. Mahawu, Lokon and Lokon onbservatory post	Not available	NS
6 - 10 March 2009	Introduction to Volcano Seismology	4 Indonesian Scientists	KKVO-Tomohon

10 – 13 March 2009	Introduction to Software tools for Volcano Seismology	4 Indonesian Scientists	KKVO – Tomohon
2009	EARTHWORM	3 (2 men, 1 woman)	KKVO - Tomohon
May 2009	Seismic instrument installation McVCO	Not available	Mt. Slamet in two stations
Nopember 2010	Installation of seismic and lahar equipment monitoring equipment at G. Merapi	Not available	Mt Merapi, Yogyakarta BPPTK - Yogyakarta
9 -13 and 23-26 May 2011	Indonesian National Volcano Early Warning System	Ms. Supriyati and Staff of BPPTK	CVGHM-Bandung
2011	VEI (Volcanic Eruption Index)	5 (3 men, 2 women)	CVGHM-Bandung
Other Workshops/Seminars/Visits reported			
2009	Volcanic geological study (stratigraphy) on eruption products at Mt. Lokon, Mt. Soputan, Mt. Mahawu, Mt. Klabat, and Mt. Tondano	1 male (Mr. Kushendratno)	North Sulawesi
2009	Volcanic gas directly practicing at fields of Mt. Lokon, Mt. Soputan, and Mt. Karangetang. VDAP also provided support in one unit gas monitor instrument Mini DOAS (FLYSPEC) which can be used to monitor volcano activities in North Sulawesi and other areas	Not available	North Sulawesi KKVO-Tomohon
28 February 2009 extended to first week of March with individual and small – group Instruction	Acquisition and processing of Volcano Remote Sensing data, use of LAHARZ debris-flow inundation modeling and in field evaluation and mapping of volcanic deposits and hazards	Not available	KKVO-Tomohon
11 – 15 Sept. 2011	"Volcano Observatory Best Practice (VOBP) - Near-Term Eruption Forecasting"	2 (both men)	Italy
23 Jan. – 4 Feb. 2012	Seismic Electonic by Andy, Rowdy, Pat, Marvin	Not available	Not available

ANNEX F: EVALUATION ACTIVITIES

Date/Time	Agenda	Respondent	Person in Charge	Venue
		United State of America		
Wednesday, September 05, 2012				
15.00 - 17.00	Meeting with Jeff Marso,	Jeff Marso,Geologist, Cascade Volcano Observatory, VDAP, USGS	VDAP Evaluation Core Team	Cascade Volcano Observatory, Vancouver WA
16.30 – 17.00	Meeting with Dr. John Ewert	Dr. John Ewert, Director Cascade Volcano Observatory	VDAP Evaluation Core Team	Cascade Volcano Observatory Vancouver, WA
Friday, September 12, 2012				
	Meeting with Charles Mandeville	Charles Mandeville Coordinator USGS Volcanic Hazards	VDAP Evaluation Core Team	By Telephone
Friday, September 14, 2012				
	Meeting with Harlan Hale	Harlan Hale, USAID/OFDA Regional Representative, USAID, Indonesia	VDAP Evaluation Core Team	USAID/Indonesia
	Meeting with Gari Mayberry	Geri Mayberry, USAID/OFDA-USSGS Geoscience Advisor, USAID	VDAP Evaluation Core Team	Washington, DC
	Meeting with Dr. John Pallister	Dr. John Pallister Chief,VDAP, USGS, Vancouver	VDAP Evaluation Core Team	Cascade Volcano Observatory Vancouver, WA
	Meeting with Langdon Greenhalgh	Langdon Greenhalgh USAID/OFDA	VDAP Evaluation Core Team	Washington, DC
Friday, September 19, 2012				
09.00 – 13.00	USAID/USGS Kick off Meeting	Lance Butler (CO), Renee Reed (CS), Gari Mayberry (COR), LangdonGreenhalgh (USAID/OFDA), Patricia Hampton (USAID/OFDA), Christine Gottschalk (USAID/OFDA), Peter Morris (USAID/OFDA), Harlan Hale (USAID/OFDA), David Applegate (Associate Director for Natural Hazards), William Scott (Cascades Volcano Observatory)	VDAP Evaluation Core Team	Washington DC
13.30 – 17.00	Global Volcano Program, Museum of Natural History Smithsonian Institute	Benjamin Andrews, curator/volcanologist; Rick Wunderman; Julie Herrick; Ed Venzke; Liz Cottrell; Sally Kuhn Sennert, geologist – USGS,	VDAP Evaluation Core Team	Washington DC
Thursday, September 20, 2012				
13.30 - 15.30	Meeting with U.S. Geological Survey Advanced System Center	Ron Keeler; Bill Burton	VDAP Evaluation Core Team	U.S. Geological Survey Advanced System Center, Reston, VA
	Meeting with Liz Rausch	Liz Rausch	VDAP Evaluation Core Team	By Email

19.15 – 19.45	Meeting with Tina Neal	Tina Neal, U.S. Geological Anchorage, AK	VDAP Evaluation Core Team	By Telephone
		Jakarta		
Sunday, September 30, 2012				
16.00 - 19.00	VDAP Evaluation Team Meeting & Indonesia Volcano Briefing		VDAP Evaluation Team; John Lockwood	Morrissey Hotel
Monday, October 01, 2012				
8.00 - 9.30	Morning Brief		VDAP Evaluation Team	Morrissey Hotel
10.00 - 12.30	USAID/OFDA meeting	Harlan Hale, Regional Officer USAID/OFDA Indonesia; Yusak Oppusunggu, Program Specialist USAID/OFDA- Indonesia	Laine Berman; Ann Lewis, John Lockwood; Joeni Hartanto	US Embassy
14.00 - 18.00	Daily Overview		VDAP Evaluation Team	Morrissey Hotel
Tuesday, October 02, 2012				
9.00 - 12.30	Morning Brief		VDAP Evaluation Team	Morrissey Hotel
15.00 - 16.30	Interview with Jonathan Griffin	Jonathan Griffin, Geophysicist | Risk and Vulnerability | Australia-Indonesia Facility for Disaster Reduction	Ann Lewis; Joeni Hartanto	Menara Thamrin Suite 1505 | Jl. MH ThamrinKav. 3 | Jakarta 10250
06.00 - 17.30	Interview with SugengTriutomo	Sugeng Triutomo Deputy Chief for Prevention and Preparedness), BNPB (National Disaster Management Agency)	John Lockwood, ErlindaPanisales	BNPB Office, Gedung Graha 55, Jl. Tanah Abang II No. 57, Jakarta 10160
Wednesday, October 03, 2012				
8.30 - 10.30	Interview Dr.RadenSukhyar	Dr. Raden Sukhyar, Chief, Secretariat of the Directorate General of Geology and Mineral Resource	VDAP Evaluation Team and Dr. Chris Newhall	Gedung DIKLAT ESDM lt 5 Kav 49, Jalan Gatot Subroto, Jakarta
14.00 - 15.30	Quantitative Evaluation Briefing & Interview with Chris Newhall	Dr. Chris Newhall, Long time VDAP collaborator Volcanology group leader Earth Observatory of Singapore	VDAP Evaluation Team	Morrissey Hotel
Thursday, October 04, 2012				
08.00 - 09.30	Interview	Alfred Nakasuma, Former Mission Disaster Response Officer, Former Head Environmental Office USAID/Jakarta Officer	Ann Lewis; Laine Berman, John Lockwood	Morrissey Hotel
10.00 - 15.00	Depart to Bandung		VDAP Evaluation Team	Arion Swiss Bell Hotel, Jl. Otto IskandarDinata 16, Bandung
		Bandung (CVGHM)		
Thursday, October 04, 2012				
15.30 - 18.30	Arrange Evaluation Agenda with CVGHM	Dr. Surono, Director, CVGHM; Sofie Yusmira Oktane W, Chief Administrative Officer, CVGHM	Laine Berman; Joeni Hartanto	Center for Volcanology and Geological Hazard Mitigation Jl. Diponegoro 57, Bandung 40122, Indonesia
Friday, October 05, 2012				

09.00 - 11.30	VDAP Program Overview	Dr. Surono, Director, CVGHM; Staff CVGHM	VDAP Evaluation Team	Center for Volcanology and Geological Hazard Mitigation Jl. Diponegoro 57, Bandung 40122, Indonesia
12,00 - 13.30	Lunch with DrSurono			SundaResto near CVGHM Office
13.30 - 16.30	Focus Group Discussion with CVGHM Staff Tour of CVGHM Facility	CVGHM Trained Staff by VDAP; Refer to List Attendant FGD Participants.	ErlindaPanisales; Joeni Hartanto; Dian Rachmawati Ann Lewis; Laine Berman; John Lockwood	Center for Volcanology and Geological Hazard Mitigation Jl. Diponegoro 57, Bandung 40122, Indonesia
19.00 - 21.00	Dinner with Dr. Sukhyar; Dr. Surono and Staff		VDAP Evaluation Team	Sunda Resto at Dago
Saturday, October 06, 2012				
10.00 - 15.00	Field Visit to TangkubanPerahu Observatory Post	Ilham Mardikayanta-Chief Observatory; Johan Kusuma-Observer (Tankuban Perahu Observatory Personnel) ; Dr. Hendra Gunawan; Ir. Hetty Triastuty (CVGHM)	VDAP Evaluation Team	Tangkuban Perahu Observatory Post, Lembang, West Java
Sunday, October 07, 2012				
10.00 – 12.00	Information Wrap-up		Laine Berman; Joeni Hartanto; Erlinda Panisales, Jack Lockwood; Ann Lewis	Arion Swiss Belhotel, Bandung
15.00 - 17.00	Interview with Jean PhillipeMetaxian, IRV Program, France	Jean Phillipe Metaxian, CVGHM advisor from France.	Ann Lewis	Jl Rascabenteng 26, Cimbuluit, Bandung
Monday, October 08, 2012				
10.00 - 13.00	Interview (Questionnaires) Trainee CVGHM Staff (Observer, and others)	Trainee Staff	Ann Lewis; ErlindaPanisales	Center for Volcanology and Geological Hazard Mitigation Jl. Diponegoro 57, Bandung 40122, Indonesia
10.00 - 12.00	Interview with Dr. Kristianto	Dr. Kristianto Head of Investigations Sub-division, Center for Volcanology and Geological Hazard Mitigation	Laine Berman	
13.30 - 14.30	Interview with Dr. Mas Atje Purbawinata	Dr. Mas Atje Purbawinata Former Head Volcano Monitoring and Investigations Division CVGHM	Laine Berman; John Lockwood; Ann Lewis	
14.00 - 16.00	Interview with CVGHM Women Staff	Anna Mathovanie, Amd; HettyTriastuty, S.si	ErlindaPanisales; John Lockwood	
Tuesday, October 09, 2012				
09.00 - 11.00	Field visits to Guntur Observatory	Ir. Mohammad Hendrasto, M.sc (Head of PPGA; DR Supriyati Dwi Andreastuti (Head of Evaluation of Geological Hazard Potential); Wardiman, Ade Koswara, Aam Mahmud (Guntur Observatory Staff)	VDAP Evaluation Team	Guntur Observatory Post, Ds. Sirnajaya, Kec. Tarogong, Garut District, West Java
11.00	Depart to Java Observatories		VDAP Evaluation Team	
Java Observatories				

Wednesday, October 10, 2012				
09.00 - 11.30	Field visits to Ciremai Observatory Post	IyusRushana, DidiSuryadi, Sukirman (Ciremai Observatory Staff)	VDAP Evaluation Team	Ciremai Observatory Post, Ds. Sambora, Kec. Cilimus, Kuningan District, West Java
11.30 - 4.30	Depart to Slamet Observatory Post		VDAP Evaluation Team	
16.30 -18.00	Field visits to Slamet Observatory Post	Sukadi, Sudrajat, LuruhNurcholis (Slamet Observatory Staff)	VDAP Evaluation Team	Slamet Observatory Post, Ds. Gambuhan, Kec. Pulosari. Purbalingga District, Central Java
Thursday, October 11, 2012				
10.00 - 18.00	Depart to Yogyakarta		VDAP Evaluation Team	
18.00 - 19.00	VDAP Evaluation Team Meeting		VDAP Evaluation Team	Novotel Hotel, Yogyakarta
		Yogyakarta – Merapi		
Friday, October 12, 2012				
09.00 - 11.30	Introduce and Arrange Agenda	Dr. IGM Made Nandaka, Division of Development Technology, BPPTK Yogyakarta; Anton Sulistiyo; Sulistiyani	Laine Berman, Ann Lewis, John Lockwood, Erlinda Panisales, Joeni Hartanto	BPPTK, JlCendana 15, Yogyakarta, 55166
	Interview trainee staff	Anton Sulistiyo (Development Technology Division Staff); Sulistiyani (Merapi Monitoring Division Staff)	Ann Lewis; Jack Lockwood	BPPTK, JlCendana 15, Yogyakarta, 55166
11.30 - 01.00	Visits Merapi Museum	Merapi Museum Staff	VDAP Evaluation Team	Merapi Museum
15.00 - 16.30	Field visits Kinahrejo, Kaliadem (damage area)		VDAP Evaluation Team	Kinahrejo, Kaliadem
16.30 - 18.30	Field visits Kaliurang-Merapi Observatory Post	Heru, Merapi Observatory Post Staff; Sulistiyani, BPPTK Staff	VDAP Evaluation Team	Merapi Observatory Post, Kaliurang, Sleman District, Yogyakarta
19.00 - 21.00	VDAP Evaluation Team Meeting		VDAP Evaluation Team	BPPTK, JlCendana 15, Yogyakarta, 55166
Saturday, October 13, 2012				
Whole day	Individual work		VDAP Evaluation Team	
Monday, October 15, 2012				
09.00 - 10.30	Overview Dr.Subandriyo, Chief of BPPTK	Dr. Subandriyo Head of BPPTK Yogyakarta	VDAP Evaluation Team	BPPTK,JlCendana 15, Yogyakarta, 55166
10.30 - 12.00	Interview Dr.Subandriyo, Chief of BPPTK	Dr. Subandriyo Head of BPPTK Yogyakarta	Laine Berman; Dian Rachmawati	BPPTK,JlCendana 15, Yogyakarta, 55166
	Interview with Staff	BPPTK Staff (Sulistiyani, Lahar Monitoring)	John Lockwood; ErlindaPanisales	BPPTK,JlCendana 15, Yogyakarta, 55166
	Interview with VDAP Trainee	BPPTK Staff	Ann Lewis;ErlindaPanisales;	BPPTK,JlCendana 15, Yogyakarta, 55166

13.30 - 14.30	Interview with Dr. Sri Sumantri	Dr. Sri Sumantri, Head of Development Technology Division	Laine Berman	BPPTK, JlCendana 15, Yogyakarta, 55166
14.30 - 15.30	Interview with Dr. Sri Subandrini	Dr. Sri Subandrini, Head of Laboratorium Division	John Lockwood; Erlinda Panisales	BPPTK, JlCendana 15, Yogyakarta, 55166
16.30 - Finish	VDAP Evaluation Team Meeting		VDAP Evaluation Team	Novotel Hotel, Yogyakarta

Tuesday, October 16, 2012

10.00 - 11.00	Interview with IOM	Diana Setiawati, Program Manager Yohan RahmadSantosa , Community Resilience Supervisor FachrulRizky Community Resilience – Knowledge Management & GIS Focus	Ann Lewis; ErlindaPanisales	IOM-UNDP-FAO Office, Kesbanglinmas, 2nd floor (right wing), Jl. Sudirman no.5, Yogyakarta
10.00 - 12.30	FGD with Jalin MERAPI (Jaringan Informasi Lintas Merapi)	Nieke Jahya, Director COMBINE Institute Mart Widarto, Program Coordinator, COMBINE Institute	Laine Berman; John Lockwood; Joeni Hartanto	COMBINE Office, Jl. KH Ali Maksum 183, PelemSewu, SewonBantul, Yogyakarta
13.00 - 14.45	Interview with Unit Telemetry SARDA DIY (DERAP)	Brotoseno, Chief of SAR D.I. Yogyakarta Province; Ibnu Garindra, Coordinator, Telemetry Unit SAR D.I. Yogyakarta Dr. Budi EkaNurcahya, Seismologist, UGM University	Jack Lockwood; Laine Berman; Joeni Hartanto	Data Center, Unit Telemetry -SAR DIY, JalanDamai No. 5, Mudal, Sleman Yogyakarta
11.00 - 12.00	Interview with FPRB	Rinto Andriono; Yuli Nugroho;Puji Santosa; Untung Tri W; Umi Azizah; Banu Subayo; Aries Susanto; Dini Isnaeni; Danang Samsu	Ann Lewis; Erlinda Panisales	FPRB Office, Kesbanglinmas, 2nd floor (right wing), Jl. Sudirman no.5, Yogyakarta
15.00 - 17.00	Interview with BPBD Province level	Ir. Gatot Saptadi, Chief of BPBD DIY Danang Samsu, BPBD DIY	Ann Lewis; ErlindaPanisales	BPBD DIY Office, Jl. Kenari No 14, Yogyakarta.
15.00 - 20.00	Community interview (Red Cross and Survivor)	Suranto; Kotel Suyanto; Wongso; Sahlan Hasbi; Tri Tukijo; Warsimin; Agung S; Wahyu Dwihantoro	Laine Berman; John Lockwood; Joeni Hartanto	Wonogiri, Pakembinangun, Pakem, Sleman, Yogyakarta

Wednesday, October 17, 2012

08.30 - Finish	VDAP Evaluation Team Meeting		VDAP Evaluation Team	

Thursday, October 18, 2012

15.35	Depart to Manado		VDAP Evaluation Team	

Friday, October 19, 2012

01.00	Arrive in Manado			Lokon Boutique Resort, Tomohon
10.00 - 12.30	Overview Meeting with Dr. Kristianto, Anna Mathovanie and KKVO Staff	Dr. Kristianto; Anna Mathovanie (CVGHM); Farid R Bina; Djudhi Djuhara; Ferry Rusmawan; Suwarno; Jemi Rontuene (KKVO staff)	VDAP Evaluation Team	KKVO, Kakaskasen Office, Tomohon
14.00.16.00	Meeting with KKVO Staff	Farid R Bina; Djudi Djuhara; Ferry Rusmawan; Suwarno; Jemi Rontuene	Joeni Hartanto	KKVO, Kakaskasen Office, Tomohon

Saturday, October 20, 2012

10.00 - 16.00	Meeting with Dr. Kristianto	Dr. Kristianto, Head of Investigations Sub-division Center for Volcanology and Geological Hazard Mitigation (CVGHM), Bandung	Ann Lewis; ErlindaPanisales	KKVO, Kakaskasen Office, Tomohon

	Data compilation and Analysis		Laine Berman	Lokon In Hotel, Tomohon
	Compilation data; Finance Report		Joeni Hartanto; Dian Rachmawati	Lokon In Hotel, Tomohon
Monday, October 22, 2012				
08.00 – 17.00	Visit Soputan Volcano Observatory Post	Sandy Maningkae; Asep Saifulloh; Fandy Rumimper	John Lockwood; Ann Lewis; Joeni Hartanto	Soputan Volcano Observatory Post
	Visit Tankoko Volcano Observatory Post	Dany F. Porawouw; Yappi F. A. Romboi	Laine Berman; Erlinda Panisales; Dian Rachmawati	Tankoko Volcano Observatory Post
Tuesday, October 23, 2012				
10-00 - 12.00	Visit Klabat Volcano (Repair the Seismograph)	Anna Manthovani (CVGHM)	Laine Berman; Erlinda Panisales	Klabat Volcano
01.00 - 17.30	Meeting with Farid R Bina and Ferry Rusmawan	Farid R Bina and Ferry Rusmawan	John Lockwood; Ann Lewis; Joeni Hartanto	KKVO, Kakaskasen Office, Tomohon
Wednesday, October 24, 2012				
Full Day	Visit Karangetang Volcano Observatory Post (Siau Island)	Daniel Hinandaleng; Mr. Didi W.P. Bina; Yudia Prama Tatipang	John Lockwood; Ann Lewis; Joeni Hartanto	Karangetang Volcano Observatory Post, SaliliVilage, Siu Tengah Sub. District, Sitaro District (Siu Island)
Thursday, October 25, 2012				
Full Day	Visit Karangetang Volcano Observatory Post (Siau Island)	Daniel Hinandaleng; Didi W.P. Bina; YudiaPramaTatipang	John Lockwood; Ann Lewis; Joeni Hartanto	Karangetang Volcano Observatory Post, SaliliVilage, Siu Tengah Sub. District, Sitaro District (Siu Island)
15.30	Meeting with BPBD, Tomohon District	Roy Ambro, Head of BPBD Tomohon William Runtukahu, Head of Division Mitigation and Preparedness Franitulu, Head of Division Rehabilitation and Reconstruction	Erlinda Panisales, Dian Rachmawati	BPBD Office, Tomohon
17.00	All Team at Manado		VDAP Evaluation Team	Grand Luley Hotel, Bunaken, Manado
Friday, October 26, 2012				
10.30 - 12.30	Data Compilation		Ann Lewis; Erlinda Panisales; Joeni Hartanto	Grand Luley Hotel, Bunaken, Manado
Saturday, October 27, 2012				
14.00 - 16.30	Data Compilation and Analysis		VDAP Evaluation Team	Grand Luley Hotel, Bunaken, Manado
Monday, October 29, 2012				
15.00	Depart to Jakarta		VDAP Evaluation Team	Grand Melia Hotel, Rasuna Said, Jakarta
9.30	Brief Meeting		VDAP Evaluation Team	Grand Melia Hotel, Rasuna Said, Jakarta
14.00	Data Analysis and Preparing Presentation		VDAP Evaluation Team	Grand Melia Hotel, Rasuna Said, Jakarta

Tuesday, October 30, 2012			
09.00	Individual Work	VDAP Evaluation Team	Grand Melia Hotel, Rasuna Said, Jakarta
14.00-18.00	Finding and Recommendation Discussion	VDAP Evaluation Team	Grand Melia Hotel, Rasuna Said, Jakarta
Wednesday, October 31, 2012			
Full day	Individual Work	VDAP Evaluation Team	Grand Melia Hotel, Rasuna Said, Jakarta
Wednesday, November 01, 2012			
Full day	Individual Work	VDAP Evaluation Team	Grand Melia Hotel, Rasuna Said, Jakarta
14.00	Depart to Yogyakarta	Erlinda Panisales; Joeni Hartanto; Dian Rachmawati	Home
Monday/Tuesday, November 05 - 06, 2012			
	Arrival to Washington	Ann Lewis and John Lockwood	Washington
Wednesday, November 07, 2012			
09:00	Presentation of Findings	Laine Berman, Ann Lewis and John Lockwood	National Press Building
Saturday, November 10, 2012			
09:00	Depart Washington for Home	Ann Lewis and John Lockwood	Home

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Proposal from the USGS to the office of foreign Disaster Ass.for new funding to develop a cooperative program with DVGHM for mitigation of volcano hazards. Concept for a North Sulawesi Volcano Observatory, Indonesia. 21 Aug 2002

Prototype Volcano Alert System TEMPLATE DRAFT 5/21/10

Trip report: Capacity-building for volcano hazards, Indonesia. 18 Feb. – 18 March, 2008

Trip report USAID/USAID/OFDA + USGS VDAP work in Indonesia May-June 2011 June 9, 2011 VDAP Team: John Pallister, Julie Griswold, Wendy McCausland, Martin LaFevers, Jeff Marso, Andy Lockhart

USAID/USAID/OFDA and USGS VDAP work in Indonesia May-June 2011

USGS-VDAP Annual Reports and Quarterly reports, FY 2005-FY 2012

Volcano Disaster Assistance Program (VDAP) team report for work with the Indonesian Center for Volcanic and Geologic Hazard Mitigation (CVGHM)John S. Pallister, Chief, VDAP

VDAP Work Plan and budget request to USAID/OFDA for USGS work under PAPA number FDA-T-00-05-00065-00 between USAID/OFDA and DOI/USGS. Prepared by John Pallister and Jeff Marso September 20, 2006

VDAP Work Plan and budget request for FY-2008 to USAID/OFDA for USGS work under PAPA number FDA-T-00-05-00065-00 between USAID/OFDA and DOI/USGS Prepared by John Pallister, 5 June, 2007

VDAP Work Plan and budget request for FY-2009 to USAID/OFDA for USGS work under PAPA number FDA-T-00-05-00065-00 between USAID/OFDA and DOI/USGS Prepared by John Pallister, 12 September, 2008 following review by TAG in July, 2008

VDAP Work Plan and budget request for FY-2010 to USAID/OFDA for USGS work under PAPA number FDA-T-00-05-00065-00 between USAID/OFDA and DOI/USGS. Prepared by John Pallister, September 21, 2012May 26, 2010, following review by TAG in July, 2009

VDAP Proposal to USAID/OFDA/TAG to revise work plans under PAPA FDA-T-00-05-00065-00 to include new work on: 1. Global Volcano Hazard Communication and 2. Hazard, Vulnerability and Risk Analysis

VDAP Proposal to USAID/OFDA/TAG to revise work plans under PAPA FDA-T-00-05-00065-00 to include new work on: 1. Global Volcano Hazard Communication and 2. Hazard, Vulnerability and Risk Analysis

USGS/USAID/OFDA Volcano Disaster Assistance Program (VDAP) for the period FY 2006-2010.

VDAP year in a nutshell* 2011

VDAP Work Plan and budget request for FY-2011 to USAID/OFDA for USGS work under PAPA number FDA-T-00-05-00065-00 between USAID/OFDA and DOI/USGS. Prepared by John Pallister and Jeff Marso, September 21, 2012

Working proposal for VDAP work elements for FY 2011

1999-2002 PASA Participating Agency Service Agreement (PASA) between the Agency for International Development and Department of the Interior, U.S. Geological Survey

Audiovisual

@America video presentation, Review of the US Geological Survey's Volcano Hazards Program (2000) Commission on Geosciences VDAP Assistance to Indonesia, September, 2012

Website

Disaster Recovery Action Plan of Merapi Volcano Area

Jogja Disaster Preparedness (Jogja Siaga Bencana)

Merapi Activities, Indonesia Geological Agency

A Year after 2010 Merapi Eruption: volcano hazard and Indonesian government mitigation measures

Volcano Disaster Assistance Program

Indonesia Volcanoes and Volcanics

Robinson and Wall, 2012,

Policy Briefing: Still Left in the Dark, CDAC Network

Global Volcanism Program: MERAPI

Ewert, J.W., and Harpel, C.J., 2004,
In Harm's Way: Population and Volcanic Risk
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"Jalin Merapi", Merapi Information Network

Surono. "Strategy of Geological Hazard Mitigation in Indonesia".

"The Indonesia Multi Donor Fund Facility For Disaster Recovery, IMDFF-DR"

"World Bank Global Facility for Disaster Risk Reduction"

USAID

CVGHM

"2010 Eruptions of Mount Merapi"

Kisah Tim Gerak Cepat TIM SAR Yogya

Sebulan Krisis Merapi: Kegempaan dan Awan Panas

http://news.detik.com/commenturut/2010/11/08/124606/1489257/10/2|2/panik-karena-isu-ledakan-merapi,-ratusan-warga-yogyakarta-mengungsi-ke-solo

ANNEX H: VDAP EVALUATION BY THE NUMBERS

Number of people in Indonesia who live with 10 km of a historically active volcano: 3,339,000
Number of seismic stations installed by VDAP since 2004: 70
Total number of on-site volcano observatories in Indonesia: 77
Number of GOI scientists and technicians trained by VDAP: 103
Number of potentially active volcanoes in Indonesia: 129
Number of historically active volcanoes in Indonesia: 80
Number of potentially active volcanoes in the continental US: 8
Number of hotels visited by VDAP evaluation team: 18
VDAP supported volcanoes visited by the evaluation team in Indonesia: 12
Observatories supported by other donors visited by evaluation team: 2
Hours by boat to Karangetang: 4.5 each way
Number of houses destroyed or damaged by the Merapi 2010 eruption: 2300*BNPB
Numbers of lives saved by warnings and evacuations, Merapi, 2010: 10,000-20,000*BNPB, with CVGHM
Weight of shipments of equipment to Indonesia: 17,400 lbs
Percentage of VDAP trainees who described their training as "in line with needs and timely": 77%
Estimated number of people who "self-evacuated" at Merapi 2010: 250,000
Number of boxes of VDAP equipment sent to Indonesia: 580
Numbers of trunks of VDAP rapid response equipment taken to Yogyakarta 2010:20
Seismic stations sent (2004-2012): 31
Value of VDAP donated replacement seismic equipment damaged by Merapi 2010:$241,000 (ANTARA)
Fatalities attributed to volcanic eruptions in North Sulawesi: 10,000
Staff at volcano observer: 3 per observatory, 8-hour shifts
Indonesian staff at CVGHM: 600
USGS VDAP staff: 5.5 FTE
Indonesian alumni of the U of Hawai'i CSAV training: 18
Average number of visitors per day to KOMBINE (Merapi DRR NGO) website: 3774*
Number of monitoring stations in North Sulawesi network: 69
According to CVGHM, 585,000 people (population of greater Seattle) are at risk from Volcanic eruptions annually.
According to the Sydney Morning Herald, number of domestic airline passengers on air routes in Indonesia in 2011: 60 million
International tourists and transit passengers on air route near Indonesia in 2011: 7 million
Number of people living in volcanic active areas: 5.5 million
Year the Volcanological Survey of Indonesia was founded: 1921

ANNEX I: DATA COLLECTION TOOLS

Focus Group Discussion Guidelines: Merapi Crisis Response

Location: _____ Number of Participants: _____ Date:

Name	Gender	Age	Position	Task

Do you know what VDAP is?	
What Capacity Building activities did you participate in?	
Show us how those activities improved the ways in which you work.	

1. SWOC

All participants take part in self-analysis to identify the issues and influences of their VDAP/or volcano monitoring training and activities. Participants will be divided into small groups according to the significant criteria such as type and role in group, gender, age, education, etc. Each group should consist of between 3-5 people. Request they brainstorm responses according to the categories below. Following the creation of SWOC tables, each group reports back on their results. Provide 20 minutes for group work. Make sure you help each group in their brainstorming exercise! Provide examples and ensure that the more the better!

IMPORTANT! Facilitators must assure participants that this evaluation is an important activity meant to strengthen and support them – *NOT* to criticize them! It is your job to create the appropriate supportive, open, honest environment so that participants feel comfortable. Don't forget – we require information regarding the good, the bad, results expected and results unexpected! DON'T FORGET TO EMPHASIZE THAT THERE ARE NO WRONG ANSWERS.

Categories	Description
Strengths/ Kekuatan program	Those things internal to the program that have worked well. Things that one is proud to say about the project/situation/activities. *What are the most important things VDAP has provided and done?*
Weaknesses/ Kelemahan program	Those things internal to the program that have not worked so well. Times when things could have gone better. *What could have been done better?*
Opportunities/ Kesempatan	Ideas on how to overcome weaknesses and build on strengths. These are external ideas for the future or thoughts on possible benefits that are not yet implemented. *What opportunities are there for future improvements that you can undertake on your own?*
Constraints/ Challenges Tantangan	The constraints that exist which reduce the range of opportunities for change. What kinds of challenges external to the program interfere with its implementation? *What are the biggest challenges you face in volcanic hazard monitoring?*

Example of chart: (not to be filled in here)

Name of Group	
Program Strengths 1. 2. 3….	**Program Weaknesses** 1. 2. 3….
Opportunities 1. 2. 3….	**Challenges** 1. 2. 3….

2. Ranking

Results of the SWOC will be taped side by side on the wall. Each group will select a leader to report on their findings. After each group has reported, request that each participant review what was written on all the charts and select the responses that they feel are the most important. Give each participant four stickers and request they go up to the SWOC tables and place a sticker on the responses that most reflect their aspirations, concerns, or thoughts. After they have all selected and marked their answers, review them to be certain that they are the most representative for them. These SWOC and ranking responses will form the trigger for the focus group discussions to follow. Make sure the SWOC tables are rolled, collected and brought to the debriefing following the days' activities.

A: Mapping exercise

How do you know if something bad is going to happen and what do you do? (Map out response on paper. Ask what the steps mean and who else needs to be contacted, why, how.)

3. FGD Guides

FGD is a continuation of the SWOC activity such that questions should lead directly out of the previous discussion and dig deeper into the issues that emerged. The following questions then are only a guide.

1: Overall performance and impact

1.A- What lessons did you learn in crisis response in 2006?	
1.A- What equipment were you given to assist in crisis response in 06?	
1.A- What equipment were you given to assist in crisis response in 10?	
1.A- How did this help improve your response time?	
1.B- What differences in response were used in 2010?	
1.D- What lessons did you learn from the 2010 response?	
1.C- How has VDAP helped in both cases?	
1.D- What kinds of technology do you most depend on for hazard monitoring?	
1.D- Where does your equipment come from? Who provided it? How is it maintained?	
1.D- How would you describe your relationship with CVGHM? (or the Merapi observatory BPPTK– if at CVGHM)?	
1.D- Is there a relative threat ranking of volcanoes in Indonesia? How is this information used?	

2. Efficiency

2.A- Was VDAP money well spent? Explain the differences between 06 and 10.	
2.B- How could timing of assistance be improved? What exactly is needed?	
2.C- Who do you coordinate crisis response with? How could timing it be improved?	

3. Coverage and Design

3.A- Was the assistance provided in line with local needs and perceptions of reality? Explain	
3.A- Do long-term monitoring networks and geologic and hazard mapping projects exist? Who has access and use of these?	
3.B- Was selection of participants and trainings appropriate? Explain	
3.C- How is information shared? With whom?	

4. Sustainability

4.A- How have lessons learned been shared, maintained and used in subsequent crises?	
4.B- What kinds of follow-up learning and skills sharing are used regularly?	
4.C- How have these lessons resulted in policy changes and new ways of crisis response in Indonesia?	
4.C- What obstacles inhibit these changes?	

5. Gender Equity

5.A- % of women staff at CVGHM, observatory, female technicians	

5.A- % of women attending capacity building training (Is women's participation encouraged?)	
5.B-How has VDAP encouraged more women's involvement?	
5.C- How could VDAP improve gender equity in the support it provides?	

Notes:

Question Key--- "Observatory Staff"

Name of group: _____ Observatory/Location: _____

Date: _____ Facilitators: _____

1. SWOC

All participants take part in self-analysis to identify the issues and influences of their VDAP/or volcano monitoring training and activities. Participants will be divided into small groups according to the significant criteria such as type and role in group, gender, age, education, etc. Each group should consist of between 3-5 people. Request they brainstorm responses according to the categories below. Following the creation of SWOC tables, each group reports back on their results. Provide 20 minutes for group work. Make sure you help each group in their brainstorming exercise! Provide examples and ensure that the more the better!

IMPORTANT! Facilitators must assure participants that this evaluation is an important activity meant to strengthen and support them – *NOT* to criticize them! It is your job to create the appropriate supportive, open, honest environment so that participants feel comfortable. Don't forget – we require information regarding the good, the bad, results expected and results unexpected! DON'T FORGET TO EMPHASIZE THAT THERE ARE NO WRONG ANSWERS.

Categories	Description
Strengths/ Kekuatan program	Those things internal to the program that have worked well. Things that one is proud to say about the project/situation/activities. *What are the most important things VDAP has provided and done?*
Weaknesses/ Kelemahan program	Those things internal to the program that have not worked so well. Times when things could have gone better. *What could have been done better?*
Opportunities/ Kesempatan	Ideas on how to overcome weaknesses and build on strengths. These are external ideas for the future or thoughts on possible benefits that are not yet implemented. *What opportunities are there for future improvements (wish list)?*
Constraints/ Challenges Tantangan	The constraints that exist which reduce the range of opportunities for change. What kinds of challenges external to the program interfere with its implementation? *What are the biggest challenges you face in volcanic hazard monitoring?*

Example of charts : (not to be filled in here)

Name of Group	
Program Strengths 1. 2. 3….	**Program Weaknesses** 1. 2. 3….
Opportunities 1. 2.	**Challenges** 1. 2.

3….	3….

2. Ranking

Results of the SWOC will be taped side by side on the wall. Each group will select a leader to report on their findings. After each group has reported, request that each participant review what was written on all the charts and select the responses that they feel are the most important. Give each participant four stickers and request they go up to the SWOC tables and place a sticker on the responses that most reflect their aspirations, concerns, or thoughts. After they have all selected and marked their answers, review them to be certain that they are the most representative for them. These SWOC and ranking responses will form the trigger for the focus group discussions to follow. Make sure the SWOC tables are rolled, collected and brought to the debriefing following the days' activities.

A: Mapping exercise

How do you know if something bad is going to happen and what do you do? (Map out response on paper. Ask what the steps mean and who else needs to be contacted, why, how.)

3. FGD Guides

FGD is a continuation of the SWOC activity such that questions should lead directly out of the previous discussion and dig deeper into the issues that emerged. The following questions then are only a guide.

Do you know what VDAP is? Explain	
What is your relationship with VDAP?	

1: Overall performance and impact

1.A- how does VDAP assistance compare to other donors assistance?	
1.A- Has VDAP assistance directly enabled you to do your job better? EXPLAIN	
1.A. How did VDAP assistance assist in monitoring of Merapi and Northern Sulawesi volcanoes during 2004-2010 period?	
QUESTIONS FOR THOSE WHO HAVE RECEIVED VDAP TRAINING	

1.A- Has VDAP training improved your ability to do your job?	
1.A Have you received enough training, or is more needed?	
1.A-What types of additional training do you need?	
1.B- What changes in volcano monitoring and hazard response have occurred through VDAP support?	
1.C – What has been the most important VDAP contributions to improving the capabilities of you Observatory?	
1.D- What kinds of technology do you most depend on for hazard monitoring?	
1.D- Where does your equipment come from? Who provided it? How is it maintained?	
1.D- Is CVGHM better able to forecast eruptions now because of VDAP aid?	
1.D- How strong is your relationship/communication with CVGHM? Is it adequate? Is it consistent? How could it be improved?	

2. Efficiency

2. A- How could VDAP aid to your Observatory be made more efficient?	
2. B- Are there ways to provide better VDAP training at less cost?	
2. C- Was there duplication of efforts between VDAP and other international donors?	

2. D-. Did VDAP provide remote-sensing materials to CVHGM in an efficient way?	

3. Coverage and Design

3. A- What kind of training have you received from VDAP? Was it what you needed?	
3. B- Were the observatories chosen for VDAP upgrades chosen correctly?	
3. C- Have VDAP training opportunities been useful to staff at your Observatory?	

4. Sustainability

4. A- Has past VDAP assistance lessened the need for future VDAP emergency responses? Can CVGHM staff handle future emergencies without VDAP support?	
4. A- [N. SULAWESI QUESTION] Since the end of VDAP support two years ago, has your ability to monitor N. Sulawesi volcanoes improved or worsened? EXPLAIN	
4.B-. How has VDAP support improved your ability to monitor volcanoes and better forcast future eruptions?	
4 .C- What changes are needed in Indonesian policies or procedures to make volcano monitoring more sustainable?	

5. Gender

5. A- What are the general differences between men and women's roles in volcano monitoring and response?	
5.A - What are the problems that prevent women from working in regional observatories?	

Group Questionnaires: VDAP Trainees

Name of group:_____ Observatory/Location: _____

Date: _____

1. SWOC

All participants take part in self-analysis to identify the issues and influences of their VDAP/or volcano monitoring training and activities. Participants will be divided into small groups according to the significant criteria such as type and role in group, gender, age, education, etc. Each group should consist of between 3-5 people. Request they brainstorm responses according to the categories below. Following the creation of SWOC tables, each group reports back on their results. Provide 20 minutes for group work. Make sure you help each group in their brainstorming exercise! Provide examples and ensure that the more the better!

IMPORTANT! Facilitators must assure participants that this evaluation is an important activity meant to strengthen and support them – *NOT* to criticize them! It is your job to create the appropriate supportive, open, honest environment so that participants feel comfortable. Don't forget – we require information regarding the good, the bad, results expected and results unexpected! DON'T FORGET TO EMPHASIZE THAT THERE ARE NO WRONG ANSWERS.

Categories	Description
Strengths/ Kekuatan program	Those things internal to the program that have worked well. Things that one is proud to say about the project/situation/activities. *What are the most important things VDAP has provided and done?*
Weaknesses/ Kelemahan program	Those things internal to the program that have not worked so well. Times when things could have gone better. *What could have been done better?*
Opportunities/ Kesempatan	Ideas on how to overcome weaknesses and build on strengths. These are external ideas for the future or thoughts on possible benefits that are not yet implemented. *What opportunities are there for future improvements (wish list)?*
Constraints/ Challenges Tantangan	The constraints that exist which reduce the range of opportunities for change. What kinds of challenges external to the program interfere with its implementation? *What are the biggest challenges you face in volcanic hazard monitoring?*

Example of charts : (not to be filled in here)

Name of Group	
Program Strengths 1. 2. 3….	*Program Weaknesses* 1. 2. 3….
Opportunities 1. 2. 3….	*Challenges* 1. 2. 3….

2. Ranking

Results of the SWOC will be taped side by side on the wall. Each group will select a leader to report on their findings. After each group has reported, request that each participant review what was written on all the charts and select the responses that they feel are the most important. Give each participant 4 stickers and request they go up to the SWOC tables and place a sticker on the responses that most reflect their aspirations, concerns, or thoughts. After they have all selected and marked their answers, review them to be certain that they are the most representative for them. These SWOC and ranking responses will form the trigger for the FGD to follow. Make sure the SWOC tables are rolled collected and brought to the debriefing following the days' activities.

A: Mapping exercise

How do you know if something bad is going to happen and what do you do? (Map out response on paper. Ask what the steps mean and who else needs to be contacted, why, how.)

3. FGD Guides

FGD is a continuation of the SWOC activity such that questions should lead directly out of the previous discussion and dig deeper into the issues that emerged. The following questions then are only a guide.

Where have you received VDAP training?	
How much time was spent in training? What is your present job?	

1: Overall performance and impact

1.A- Has VDAP training improved your ability to do your job?	
1.A Have you received enough training, or is more needed? 1A What types of additional training do you need?	
1.B- Do you feel that your training has enabled you to one day helping to save lives in Indonesia?	

1.D- What kinds of technology do you most depend on for hazard monitoring?	
1.D- Where does your equipment come from? Who provided it? How is it maintained?	
1.D- How would you describe your relationship with CVGHM? (or the Merapi observatory BPPTK– if at CVGHM)?	
1.D- Is there a relative threat ranking of volcanoes in Indonesia? How is this information used?	

3. Coverage and Design

A. What kind of training have you received from VDAP? Was it what you needed ?	
B. Choice of Observatories: how were they ideniteid ; were they enough	

Additional Questions:

What is your gender?

How long have you worked for VSI/CVGHM?

What is your job title?

What is your specialty (Seismology? Deformation?, Geochemical? Communications? Other?

How long have you worked at this observatory?

Do you use specialized volcano monitoring equipment in your job?

What kinds of equipment?

Where did this equipment come from?

How were you trained to use this equipment?

Are you able to obtain parts and tools needed to repair this equipment?

Was this equipment donated? If so – by whom?

Have you ever met visitors from the USGS VDAP group

Have you attended training workshops sponsored by VDAP?

If so – where?

What additional support do you need to do your job better?

Better equipment?

More training?

Other?

["Satu Tim" problem]

How well do you feel your work is understood and appreciated by other staff at your Observatory?

Specific Questions for KKVO Staff (Northern Sulawesi)

GB what are your normal daily responsibilities?

What is the geographic range of your coverage?

What is different now?

What kinds of training did you receive? Was the training relevant, timely, appropriate, provided to the right people, reinforced, shared?

Do many people change jobs, move on, move up? What percentage of the staff now were here in 04-10 and beyond?

What other training is needed?

Was the equipment provided sufficient to the task, the right quality, delivered on time, easy to maintain, consistent with other monitoring locations

Can you give us an example of an incident or activity that demonstrated VDAP support?

What has changed since 2010?

To your knowledge have the lessons learned from the VDAP support in KKVO been applied elsewhere?

What do you wish had been done differently?

What are the main problems you face in your job today?

What would you do if you had more resources?

Questionnaire Guide for Cascades Volcano Observatory/ VDAP Vancouver, WA

Date:
In attendance:
1: Overall performance and impact

1.A- How would you characterize the overall performance and impact of VDAP capacity building?	
1.A.What are the most significant changes you've seen over the past years (esp. 04-12)	
1.A What is USAID and Indonesia goals? Do you feel the goals have been met? Can you offer a specific example?	
1. A. What is different about VDAP support and other donors' support to CVGHM?	
1.B. In what ways did the experience with the Merapi eruptions and other VDAP capacity building work help further understanding of volcano forecasting?	
1.B. in what ways did the VDAP assistance during the Merapi and other Indonesian volcano eruptions add value to the CVGHM overallability to response?	
1.C. Can you give examples of evidence that capacity was improved/increased?	
1.C What could the VDAP program done better?	
1C, What are the biggest challenges you face?	
1 D. Has the ability of the Indonesian authorities to forecast and respond to eruptions improved as a result of VDAP assistance	

1D. What does VDAP do in Emergency response	
1D. Merapi: what was different about VDAP response in 06 and 10?	
1D. How could one measure improvement in forecasting?	

2. Efficiency

2.A- Was VDAP money well spent? Were the proportions to equipment training, salaries about right? Did they change over time?	
2.B- Where might VDAP best find effficiencies?	
2.C Can you give an example of effective coordination between donors?	
2 B. Remote sensing: is the training for remote use, and use of remote sensing data at the appropriate level, and most cost effective? How do you kow?	

3. Coverage and Design

3.A- was the assistance in line with Indonesian needs and priorities? Sufficient?	
3.B. How are training participants identified? How is their knowledge shared?	
3.B-. Was VDAP support well-distributed? Spread too thin? Too concentrated in a few direct beneficiaries?	
3 C. Did the "right" people receive training or should others have priority? Both genders fairyl represented?	
3.E- Merapi: What is the number of lives and amount of property saved in part due to VDAP assistance? Please explain how the VPI works	

and your best guess on how we might reckon this.	
3E. How might we value the preservatin of livelihoods	

4. Sustainability

4.A- Are the VDAP capacity building actitivies sustainable? What are the impediments to sustainability?	
4.B- Is there evidence of staff retention in CVGHM? Rotation? Loss?	
4.B. is there eveidence taht the CVGHM has continued to expand monitoring network at additional volcanoes?	
4.C- assumptions/challenges: what are the obstacles to retining new skills?	
4.C- How adaptable is the staff to changing technology? (example)	
4C. Other challenges related to the enabling environment	

5. Gender Equity

5.A- What actions has VDAP taken to ensure gender equality? (% of women staff at CVGHM, observatory, female technicians)	
5.A- % of women attending capacity building training (Is women's participation encouraged?)	
5.A. Do men and women have equal opportunities for promotions? What obstacles might stand in the way of realizing this goal?	
5C. What additional steps might VDAP undertake to improve gender equity?	
5C. May we please speak to men and women alone to ask a few questions.	

Questionnaire Guidelines for USAID/OFDA, US Embassy and Others donors

GOAL OF VDAP: to strengthen local volcano monitoring, mitigation and response capacity through technical assistance to CVGHM
-capacity bldg. in No Sulawesi 2004-2010
-capacity bldg. in Java FY 10 onward
-VDAPs emergency response to Merapi eruptions in 2006, 2010

Goal of evaluation: overall performance and impact, efficiency, coverage and design, sustainability, gender equity.

General	
1.A. What has been your role and relationship with VDAP? For how long?	
1A. What is your overall impression of the quality and impact of VDAP? Can you provide examples of to support your opinion?	
1D. Has the ability of Indonesian authorities to forecast and respond to eruptions improved? How can you tell?	
1C. What is the most significant impact of VDAP?	
1E. Could you offer us assistance in suggesting ways we can quantify the number of lives and the amt of property saved in part due to VDAP assistance?	
1F., 2A Do you think VDAP Assistance is cost effective, compared to other investments – value of preservation of livelihoods	
2C. donor coordination: how does VDAP coordinate with other donors? Which? Is it useful, effective?	
3 A. Coverage and design: appropriate and sufficient?- "successful"	
3C. are you aware of Discrepancies between beneficiary groups	

4A. are VDAP activities sustainable? Evidence of increased Indonesian ownership?	
4B. Evidence in N Sulawesi that skills, equipment, behavior change retained 2 yrs following the end of the program?	
4C. How could it be more sustainable? –policy, enabling environment?	
5A. Gender equity: did VDAP ensure equal involvement of men and women?	
USAID Specific	
1. VDAP represents What part of USAID/OFDA support in Indonesia? $? Other programs?	
2. Can you tell us about VDAP support to Merapi eruptions in 06-10? Compare/contrast? Dollar amounts?	
3. Does USAID have other DRR programs or emergency preparedness programs in Indonesia? With whom should we meet?	
4. What is your understanding of what is meant by Science Diplomacy? How do you see VDAP in that role? DO we need to see anybody in the Embassy?	
5. Other donors, partners we shouldn't miss?	
6. What will you be looking for in this evaluation? What would you like to ask if you could?	
7. Let's review dates, deliverables, workplan, communication…	

ANNEX J: WORK PLAN

Location/sites	Proposed dates
Kick off meeting	September 19
Final inception report	September 26
Final work plan	September 26
Travel to CVO	September 22
CVO	September 23-25
Travel	September 26
Jakarta	September 28-October5
Travel to Bandung	October 5
Bandung	October 5-9
Site visit TBD (Slamet, Cereme, Guntur)	October 9-11
Travel to Jogjakarta	October 11
Jogjakarta	October 11-18
Travel to KKVO	October 18
North Sulawesi	October 18-28
Travel to JKT	October 28
Jakarta	October 28-Nov 4
Presentation to Mission	November 2
Return to Washington DC	November 5
Presentation of draft to AID/W	November 9
Draft report due	November 26
USAID comment period	November 26-30
Final Evaluation Report due	December 15

ANNEX K: DISCLOSURE OF CONFLICT OF INTEREST

DISCLOSURE OF CONFLICT OF INTEREST FORM

Name John P. Lockwood	
Title Volcanologist	
Organization IBTCT	
Evaluation Position? →	Team member- Volcanologist
Evaluation Award Number (contract or other instrument, if applicable)	AID-OAA-TO-12-00038
USAID Project(s) Evaluated (Include project name(s), implementer name(s) and award number(s), if applicable)	Evaluation of the USAID/OFDA – USGS Volcano Disaster Program in Indonesia
I have real or potential conflicts of interest to disclose.	Yes (No)
If yes answered above, I disclose the following facts: Real or potential conflicts of interest may include, but are not limited to: 1. Close family member who is an employee of the USAID operating unit managing the project(s) being evaluated or the implementing organization(s) whose project(s) are being evaluated. 2. Financial interest that is direct, or is significant though indirect, in the implementing organization(s) whose projects are being evaluated or in the outcome of the evaluation. 3. Current or previous direct or significant though indirect experience with the project(s) being evaluated, including involvement in the project design or previous iterations of the project. 4. Current or previous work experience or seeking employment with the USAID operating unit managing the evaluation or the implementing organization(s) whose project(s) are being evaluated. 5. Current or previous work experience with an organization that may be seen as an industry competitor with the implementing organization(s) whose project(s) are being evaluated. 6. Preconceived ideas toward individuals, groups, organizations, or objectives of the particular projects and organizations being evaluated that could bias the evaluation.	

I certify (1) that I have completed this disclosure form fully and to the best of my ability and (2) that I will update this disclosure form promptly if relevant circumstances change.

Signature:	John P. Lockwood
Date:	9 November, 2012

DISCLOSURE OF CONFLICT OF INTEREST FORM

Name Ann Lewis	
Title	
Organization IBTCI	
Evaluation Position?	Team member- Evaluation Specialist
Evaluation Award Number (contract or other instrument, if applicable)	AID-OAA-TO-12-00038
USAID Project(s) Evaluated (Include project name(s), implementer name(s) and award number(s), if applicable)	Evaluation of the USAID/OFDA – USGS Volcano Disaster Program in Indonesia
I have real or potential conflicts of interest to disclose.	Yes (No)
If yes answered above, I disclose the following facts: Real or potential conflicts of interest may include, but are not limited to: 1. Close family member who is an employee of the USAID operating unit managing the project(s) being evaluated or the implementing organization(s) whose project(s) are being evaluated. 2. Financial interest that is direct, or is significant though indirect, in the implementing organization(s) whose projects are being evaluated or in the outcome of the evaluation. 3. Current or previous direct or significant though indirect experience with the project(s) being evaluated, including involvement in the project design or previous iterations of the project. 4. Current or previous work experience or seeking employment with the USAID operating unit managing the evaluation or the implementing organization(s) whose project(s) are being evaluated. 5. Current or previous work experience with an organization that may be seen as an industry competitor with the implementing organization(s) whose project(s) are being evaluated. 6. Preconceived ideas toward individuals, groups, organizations, or objectives of the particular projects and organizations being evaluated that could bias the evaluation.	

I certify (1) that I have completed this disclosure form fully and to the best of my ability and (2) that I will update this disclosure form promptly if relevant circumstances change.

Signature:	Ann von Buesin Lewis
Date:	9 Nov 2012

DISCLOSURE OF CONFLICT OF INTEREST FORM

Name	Laine Berman
Title	Team Leader
Organization	IBCTI
Evaluation Position?	Team Leader / Team member
Evaluation Award Number (contract or other instrument, if applicable)	AID-OAA-TO-12-00038
USAID Project(s) Evaluated (Include project name(s), implementer name(s) and award number(s), if applicable)	USAID/USAID/OFDA funded VDAP in Indonesia
I have real or potential conflicts of interest to disclose.	Yes No
If yes answered above, I disclose the following facts: Real or potential conflicts of interest may include, but are not limited to: 1. Close family member who is an employee of the USAID operating unit managing the project(s) being evaluated or the implementing organization(s) whose project(s) are being evaluated. 2. Financial interest that is direct, or is significant though indirect, in the implementing organization(s) whose projects are being evaluated or in the outcome of the evaluation. 3. Current or previous direct or significant though indirect experience with the project(s) being evaluated, including involvement in the project design or previous iterations of the project. 4. Current or previous work experience or seeking employment with the USAID operating unit managing the evaluation or the implementing organization(s) whose project(s) are being evaluated. 5. Current or previous work experience with an organization that may be seen as an industry competitor with the implementing organization(s) whose project(s) are being evaluated. 6. Preconceived ideas toward individuals, groups, organizations, or objectives of the particular projects and organizations being evaluated that could bias the evaluation.	

I certify (1) that I have completed this disclosure form fully and to the best of my ability and (2) that I will update this disclosure form promptly if relevant circumstances change.

Signature:
Date:
21 Nov 2012

ANNEX L: MERAPI CASE HISTORY ---THE STORY OF PAK KOTEL SUYAMTO

Suyamto Kotel was born in 1972, high on the southeastern slope of Merapi, in the small sub-village of Petung, Kepuharjo village, Cangkringan sub-district, Sleman district – about 6 km from the volcano's summit. His parents had been born in Petung, as had his ancestors "as long as people could remember." 115 families lived in Petung (about 300 people), and most of them were related in some way. Farming was the only occupation practiced by villagers, with most villagers tending small rice paddies and raising a few chickens. Kotel loved cattle, was known as a cattle breeder, and owned four cows and one calf in the fall of 2010. He had never married, and lived with his mother and four close relatives in a sturdy brick and mortar three-room home - one of the nicest in Petung. He had recently built an attached room for himself. He was well aware of the threat posed by Merapi, and had witnessed the eruptions of 2001 and 2006, which had devastated areas west of his village. He did not worry much about Merapi though, as no "lava flow" had ever come near Petung in the memories of people living there.

On 24 October, 2010, Pak Surono, Director of the prestigious Pusat Vulkanologi dan Mitigasi Bencana Geologi (CVGHM) had driven through his district, warning people that Merapi was preparing for a large, dangerous eruption. On 25 October a public AWAS warning was made by the Indonesian National Agency for Disaster Management (BNPB) for all people living within 10 km of Merapi's summit. Although Merapi's "Spiritual Guardian", Mbah Maridjan, was telling his followers that Merapi's "lavas" would never reach his village of Kinahrejo where he lived, Kotel was receiving warnings from friends that the threat was very serious, and he should evacuate. Kotel arranged for his family to evacuate from their home on the 25th, but stayed behind to tend to his cows, and to warn nearby villagers of the peril they faced. He was high on Merapi's slopes urging stragglers to leave when he witnessed the large pyroclastic flows that destroyed Kinahredjo and killed Mbah Maridjan and more than 20 others in Kinahrejo on 26 October. This eruption spared Petung, and many farmers returned there often to tend their animals. Kotel was in Petung on the late evening of 03 November when, unknown to him, vital information about an increasingly dangerous increase in growth of a lava dome at Merapi's summit was being provided by VDAP Chief John Pallister to Pak Surono and a high level "Emergency Committee" meeting in Yogyakarta. Based on this critical new information orders were given that night to expand the evacuation zone from a 10 to 15 km radius from the

Kotel Suyanoto standing by the ruins of his home - destroyed by a Merapi pyroclastic flow on 05 November, 2010.

summit. Kotel received this news via SMS message from a community volunteer with the Red Cross who warned that a major eruption could happen soon and that even Petung was in danger! Reluctantly, Kotel decided he had to leave his prized cows and all belongings. First, he contacted every person left in Petung, and at about 2 am on the morning of 04 November headed down the mountain with about 60 others to safe areas beyond the new 15 km AWAS zone. He was unable to take any belongings besides his motorcycle, on which he carried three others to safety. Major pyroclastic flows poured far down Merapi's flanks over the next two days and on the early evening of 04 November Kotel received word that the AWAS zone had been extended to 20 km, and he again moved farther away. He later learned that every home in Petung was leveled and burned sometime on 05 November. Because of the warnings that Kotel received and was able to personally deliver to neighbors, only one Petung resident perished – a individual with an intellectual disability who ran off in fear – up the mountain.

Kotel is philosophical about his loss, stating that:

"I lost everything – but understood that this was God's will. I was born into this world with nothing, and I had nothing after Merapi took my home, but I knew that God wanted me to live, and I shall rebuild my life."

Kotel knows nothing about "the story behind his story", but the reality is that he and thousands of his neighbors are alive today only because of a series of events that began when a VDAP scientist presented critical information to Indonesian authorities; information that led to the triggering of warnings by community volunteers that saved his life.

Permanent Settlement, Jurangjero Sub-district, Kepuharjo, Cangkringan, Sleman. Mr. Kotel's "new home".

Statement of Differences to Final Evaluation Report

Contract No. RAN-I-00-09-00016-00
Implemented by International Business and Technical Consultants, Inc. (IBTCI)

Submitted by

John S. Pallister, Chief
Volcano Disaster Assistance Program
Address: U.S. Geological Survey, 1300 SE Cardinal Court, Vancouver, WA 98683, USA

The Report is a fair and accurate assessment. However, there is one significant error and misconception that requires correction and explanation. It is not evident that the reviewers were aware of the extent of strategic planning involved in joint work by VDAP and CVGHM, nor of the extent that this planning is documented in Implementing Arrangements, which are parts of the U.S. – Indonesian Memorandum of Understanding for General Cooperation in Science and Technology for Natural Hazard Assessment, Analysis, Warning, Preparedness, and Mitigation.

- Recommendations (Page x): *"VDAP and GOI develop a strategic plan to cover the period of 2012-2017. Elements of this plan should include an overall goal statement and strategic objectives with measurable indicators, inputs, activities, outputs, outcomes, and results. Post 2017 transition should be planned. An internal participatory mid-term evaluation should be planned for 2015."*

VDAP and CVGHM currently conduct joint work under Implementing Arrangement No. 2 (U.S. Department of Interior document ID-11.0200) to the Memorandum of Understanding (MOU) between the Government of the Republic of Indonesia and the Government of United States on "General Cooperation in Science and Technology for Natural Hazard Assessment, Analysis, Warning, Preparedness, and Mitigation." The current Arrangement covers the period 2013-2017 and specifies overall project goals and objectives. The Arrangement also includes an Annex with detailed plans and timelines for specific activities, which constitute benchmarks and measurable indicators of performance. These goals, objectives, activities and timelines were negotiated jointly by CVGHM and VDAP, utilizing inputs from both organizations concerning gaps in monitoring (based on CVGHM's National Strategy "Blueprint" for 2010-2014) and strategic needs for training and infrastructure development. The Implementing Arrangement to the MOU (and the MOU itself) constitutes a strategic plan for the period in question. Further, VDAP's quarterly and annual reports describe and quantify outputs, outcomes and results, and annual planning meetings between VDAP and CVGHM leadership and between VDAP and OFDA's Technical Assistance Group constitute progress reviews and updates to the strategic plan.

- Limitations (Page 11): *"VDAP's Indonesia program originally gathered no baseline data, and had no strategic plan, no formal project document, no logical framework, no program monitoring plan, no established indicators (until 2012) available to external evaluators to base their review."*

This statement is incorrect. VDAP's modern Indonesia program began in 1995 with a proposal for a joint project in North Sulawesi, developed by officials from VDAP and the Volcanology Survey of Indonesia (VSI, predecessor to CVGHM). The proposal was favorably received by OFDA in 2001-2002, but was put on hold due to security issues related to the terrorist bombing in Bali on 12 October 2002. In 2004, Senior Volcanologists Chris Newhall and John Pallister of VDAP conducted a fact-finding and strategic planning trip to North Sulawesi, meeting with senior managers, scientists and operational staff of CVGHM at Kakaskasen, North Sulawesi, site of the Lokon and Mahawu volcano observatories.

The CVGHM-VDAP team conducted a three-week-long planning and evaluation program in North Sulawesi, discussing then current gaps in monitoring and science, CVGHM needs and priorities and VDAP capabilities, and visiting field sites intended for infrastructure improvement and for training in hazard assessment. The outcome of this trip was a strategic plan containing overall goals, objectives and logical framework, and a detailed timeline for specific activities required to build a regional volcano observatory at Kakaskasen and to enhance monitoring for the 10 high-risk volcanoes in North Sulawesi and the Sangihe Islands. The North Sulawesi VDAP-CVGHM plan was linked to and nested within CVGHM's national strategic plan for volcano monitoring, hazard assessment and risk reduction, which was being developed simultaneously. The North Sulawesi VDAP-CVGHM strategic plan was formalized as Implementing Arrangement No. 1 (U.S. Department of Interior document ID-11.0100) to the Memorandum of Understanding (MOU) between the Government of the Republic of Indonesia and the Government of United States on "General Cooperation in Science and Technology for Natural Hazard Assessment, Analysis, Warning, Preparedness, and Mitigation." An Annex that is part of the Implementing Arrangement provided a detailed listing and timeline for join projects to be completed during the period 2008-2012, which served as benchmarks and indicators of performance. VDAP's subsequent quarterly and annual reports provide updates on progress and accomplishments, leading to completion of the planned work in 2012. Implementing Arrangement No. 1 was signed by the Director of the Geological Agency of Indonesia and the U.S. Ambassador to Indonesia and witnessed by the Indonesian Minister of Energy and Mineral Resources at a public ceremony in Jakarta on 14 March 2008.