

Development of Multiparameter Telemetry System for Monitoring and Early Warning Lahar at Merapi Volcano, Java, Indonesia

Made Agung Nandaka, Sulis Tiyani, Anton Sulistio, Nurudin Basori

Geological Agency of Indonesia, Indonesia

E-mail: sulistiyani@bpptk.esdm.go.id

Merapi Eruption 2010 (VEI 4) considered as the biggest eruption in the last 100 years. Volcanic material deposition approximately 100 million m³ and mainly concentrated in the southern and western slopes. Very high rainfall during the rainy season eroded the sediment easily and triggers lahar. More than 300 lahars events occurred in 12 rivers during 2010 to 2012. About 10% of the lahars event caused huge damage and losses along Putih, Boyong and Gendol rivers.

During 2010-2012, 24 stations have been established for monitoring and early warning lahar located near the rivers on the southern and western slopes. Five stations were built in November 2010 and supported technically by VDAP (USGS). Furthermore, 15 stations built in January 2011 and 4 stations in January-March 2012 in collaboration between the Geological Agency with National Agency for Disaster Management Indonesia.

Five of 24 stations are rainfall monitoring located at the upper flank as the initial information of lahar possibility. Five stations have one seismic sensor (geophone) of each. One station only equipped with a visual camera, nine stations of each have a combined of rainfall sensor, geophone and visual camera and four stations of each have a camera and geophone.

IP camera has specification of motion resolution JPEG 4CIF with 12X optical zoom, geophone of 10 Hz natural frequency and tipping bucket rain gauge. Data transmission from field stations to the central processing unit use a combination of broadband digital radio and analog VHF radio.

Data processed separately for each signal, such as rainfall, visual camera and seismic data. Rainfall warning is given if the cumulative rain intensity exceeds the threshold i.e. greater than 40 mm in 15 minutes. Threshold value for RSAM varying between 3000 - 7000 depends on background noise at each station. Information of rainfall intensity and RSAM (seismic) distributed via SMS and emails to the list of recipients automatically. Visual information can be accessed continuously via www.merapi.bgl.esdm.go.id. Local governments were given access to all information directly from the data center over internet protocol.

Data obtained from this monitoring system is a qualitative and early warning not yet delivered specifically. However, as a ringing bell to a potential lahar event this system plays an important role of the overall Merapi lahar mitigation.