Quantifying volcanic hazards and potential impacts at Gede volcano, Indonesia

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Gede volcano, Java, has erupted more than 26 times in the Holocene, with at least four moderate size explosive eruptions. Due to its proximity to Jakarta and Bandung it poses one of the most significant volcanic hazards in Indonesia. Between c.0.2 M to 38 M people live within a radius of 10 to 100 km of Gede's crater. This volcano has had 11 unrest phases since 1990 (seismic swarms) but has not had an eruption since the last phreatic activity in 1957. This means that whilst there is potentially a large population at risk from future eruptions, they would not necessarily be aware of the likely hazards from an eruption at Gede. We evaluate three of the potential hazards from this volcano: ash fall, pyroclastic flows and lahars. To do this we use a combination of numerical models (ASHFALL, TITAN2D and LAHARZ) and updated basic geological knowledge of past history of the volcano. We found that for eruptions VEI 3-5 there is ?50% probability of >1mm of ash affecting at least 5,000 and up to 200,000 people. Pyroclastic flows generated by Gede have the potential of travelling up to c.15km, directly into heavily populated areas, further then was previously expected based on the previously understood geologic history. We also show that lahars may have the potential to extend up to 30km in some directions. This could affect local agriculture and fisheries. We use this information to develop a new event tree that will be useful for community preparation and for raising awareness of the possible hazards related to this volcano.