COLLECTING EMPIRICAL IMPACT DATA: The Merapi 2010 eruption st

Susanna Jenkins

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In collaboration with JC. Komorowski, P. Baxter, R. Spence, F. Lavigne, Surono, A. Picquout , E. Mei, N.Cholik, Sardjito Hospital, Universitas Gadjah Mada, Village chiefs and local population affected by the Merapi 2010 eruption

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OUTLINE:

- The need for empirical eruption impact data
- Merapi 2010 eruption
- A new multi-disciplinary eruption impact assessment
- Empirical impact data collected through media images
- Discussion points



Damage to the village of Balerante, 5km from Merapi volcano during the October-November 2010 eruption [Photo: courtesy of Balerante village chief]



Empirical eruption impact data

- Rarity of large explosive eruptions in populated areas means that forecasting future impacts (damage, casualties) is characterised by significant uncertainty
- Provides detailed catalogue of event and impacts; local scientists often have limited resources at times of crisis
- Data can be used to derive the physical processes involved
- Empirical impact data help to reduce uncertainty in establishing relationships between the process and impact
- Implications for other at-risk volcanic areas
- Merapi 2010 large explosive eruption was unique opportunity to study explosive eruption impacts on a densely populated area, i.e. 'forensic volcanology'



Merapi 2010 eruption

- Rapidly escalating crisis: First eruption 26 Oct 2010;
 Final (paroxysmal) eruption 5 Nov 2010
- Exclusion zones progressively increased 2.5km -> 20km;
 Some shelters relocated with expanding exclusion zone
- Over 400 official deaths; ~200 from contact with Pyroclastic Density Currents (PDCs)
- PDCs caused casualties up to 15.5km (17.6km) from source
- >1 million people displaced
- Total damage and losses exceeds 4 trillion rupiahs (£286M)
- Future lahar hazard severe because of deposits
- Last eruption of this size was 1872: change in style?



SPOT5 image, 15th November 2010, IPGP

26 October 2010

Kinahrejo

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All images: Boston.com; 27 October 2010

DIGITS (LEOUTH)

OT5 image, 15th November 2010, IPGP **26 October 2010**

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Merapi 2010 eruption



5 November 2010

Image: S.Jenkins; 2 December 2010



Image: www.boston.com; 5 November 2010

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Merapi 2010 eruption: Collecting empirical impact data

- Rapidly escalating and declining crisis: Enter safely; Pristine impact environment
- Multi-disciplinary assessment: Geology, Damage, Casualties
- Multiple data sources: Remote; Field; Desk (e.g. GIS)/Laboratory
- Remote assessment: Map impact across large areas; Focus on areas of highest impact; Assess damage throughout eruption; Impact environment at time of impact
- Longitudinal study: Field missions 3 weeks, 8 months and 1 year after eruption (and continuing)
- <u>Collaboration and support of local scientists and population</u>
- Jenkins et al. (in review). A new multi-disciplinary impact assessment. JVGR



Remote sensing data also include professional and social media images and footage freely available on the internet throughout the eruption.

These allowed us to:

- Constrain rescue and fatality times
- Learn more about damage and casualties around the time of impact, e.g. ash adherence to casualties, ongoing fires, hot ash deposits
- See impact in areas subsequently destroyed
- Identify if impact environments were pristine at the time of our visit



JCK interpretation: 1 November 2010 10:15 local PDC view due East

Very nice example of the liftoff plume (Mandrews and Manga, Geology, 2011) due to flow block and diversion by Kendill 200 m high ridge forming the south part of the Gendol funnel.







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S. Jenkins – 6 December 2010

Bronggang village www.boston.com – 5 November 2010 A STREET AND A STREET AND A STREET AND A Sabo dam 100m University of BRISTOL

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Google Translator: « Circulating on the internet and Blackberry Messenger a picture showing the final seconds of hot clouds that reportedly swallow a car driven by volunteers.

In the photo, it appears that hot clouds swallow all those in front. The blue vehicle is carrying rescuers who then become victims. Reportedly, four volunteers died from crashing in the hot cloud. »

Inilah Foto Wedhus Gembel Akan Telan Mobil Relawan

Posted in Amazing World on 02/11/2010 by juliussumant

Inilah.com | Senin, 1 Nopember 2010



Beredar di internet dan Blackberry Messenger sebuah foto yang menunjukkan detik-detik akhir awan panas wedhus gembel akan menelan sebuah mobil yang kabarnya dikendarai oleh para relawan.

Dalam foto itu, tampak kepulan awan panas bergulung-gulung menelan semua yang berada didepannya. Kendaraan berwarna biru yang ditumpangi para relawanpun menjadi korbannya. Dikabarkan, empat relawan tewas akibat terhempas awan panas dalam peristiwa itu. [mah]

http://nasional.inilah.com/read/detail/934792/inilah-foto-wedhusgembel-akan-telan-mobil-relawan



Discussion points

• Ethical/Moral difficulties in obtaining critical empirical data, should there be restrictions on taking, distributing and/or using graphic images?



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Discussion points

- Ethical/Moral difficulties in obtaining critical empirical data, should there be restrictions on taking, distributing and/or using graphic images?
- What role does social media have in communication, (self) evacuation and rumour spreading?
- Was it a well managed crisis? Or were they just lucky?
- Pros/Cons of evidence-based, e.g. SHV, versus solo expert, e.g. Merapi, crises management
- How did so many people successfully evacuate so quickly? Lessons for other densely populated volcanoes, e.g. Vesuvius
- Management approach to next eruption – precautionary? Logistically possible given the number of people and financial implications?
- How to incorporate a wide range of potential surge and flow behaviour in short-term and long-term planning

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THANK-YOU

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