

Anticipating disasters using community knowledge: A case study of a typhoon-triggered lahars disaster at Mayon volcano, Philippines

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1. Introduction

The importance of integrating communities' knowledge of their own risk into risk reduction strategies is widely acknowledged. Furthermore, communities' knowledge of previous disasters can be a vital source of information to scientists and local governments in the absence of wide-scale scientific monitoring. However, anticipating disasters necessitates acknowledging when past experience is not necessarily indicative of the future and, therefore, when communities' memories of previous events may not sufficiently prepare them for subsequent disasters. This is particularly relevant in the case of multi-hazard disasters because communities may not have previously experienced the combinations of interactions between hazards.

In order to explore the role of community knowledge in anticipating these disasters, we present a case study of the 2006 Typhoon Reming (Durian) triggered lahars disaster that occurred at Mt Mayon volcano in the Philippines. In 2012, semi-structured interviews were conducted with eight scientists, four representatives of local government and seven NGO staff (collectively referred to as key stakeholders), along with 46 representatives of affected communities. The analysis was also supported by secondary information (journal articles and internal reports). We have analysed this case study in order to elucidate the extent to which the multi-hazard characteristics of the event were anticipated. The presentation pays particular attention to the role of community knowledge, presenting key lessons from this disaster of particular interest to those addressing the interface between community and scientific knowledge.

2. Lahars at Mayon volcano



Figure 1 View of Mayon volcano from Ligñon Hill
Source: author's own, October, 2012

The Philippines is often described as a disaster hotspot and many of its population are familiar with the effects of a number of geophysical and hydro-meteorological disasters. One of the most active volcanoes in the Philippines, Mt Mayon, is located in the province of Albay, which is highly exposed to multiple hazards. Over a million people are threatened by Mayon volcano (APSEMO, 2011), but many communities depend on the slopes of the volcano for their livelihood. Given the wet climate and high incidence of typhoons it is unsurprising that lahars are a common occurrence during and after eruptions.

Hot lahars are often larger and more destructive than cold lahars, but it is the typhoon related post-eruption lahars that have caused more human fatalities – partly owing to a decline of volcanic awareness of Mayon residents (Umbal, 1986). Our interviews with local government officials, scientists and NGOs indicated that residents are perceived to be aware of the types of hazards they are exposed to, however we found that most residents were surprised by the occurrence of the Typhoon Reming lahars.

3. The Typhoon Reming lahars disaster

It had been five years since the last explosive eruption of Mayon volcano when Super-typhoon Reming brought unprecedented rainfall that triggered lahars on the 30th November 2006 (Figure 2). Whilst there was a range of hazards that affected thousands of residents (e.g. wind, flooding, landslides, lahars and storm surge) it was the intense rainfall triggered lahars that caused most of the 1266 deaths in Albay (APSEMO, 2006). Owing to the magnitude of the typhoon, some NGOs and local government were affected by the typhoon itself and emergency responders were unable to reach lahar affected communities until the typhoon had abated. The situation emphasised the importance of community members as first responders to disasters.

Of those NGOs interviewed, two (in partnership) had already been implementing a programme of community-based DRR and hazard mapping with communities vulnerable to volcanic hazards. In spite of this, we found that these communities were surprised by the occurrence of the Reming lahars. The hazard mapping the NGOs implemented with these communities was criticised by one partner for relying solely on the knowledge of the community instead of combining this with the insight of scientists.

The Philippines Institute of Volcanology and Seismology (PHIVOLCS) had produced a lahar hazard map in 2000, and most of the areas impacted by the Reming lahars were already identified as hazardous areas in this map. However, the majority of these stakeholders emphasised the unexpected magnitude of the lahars.

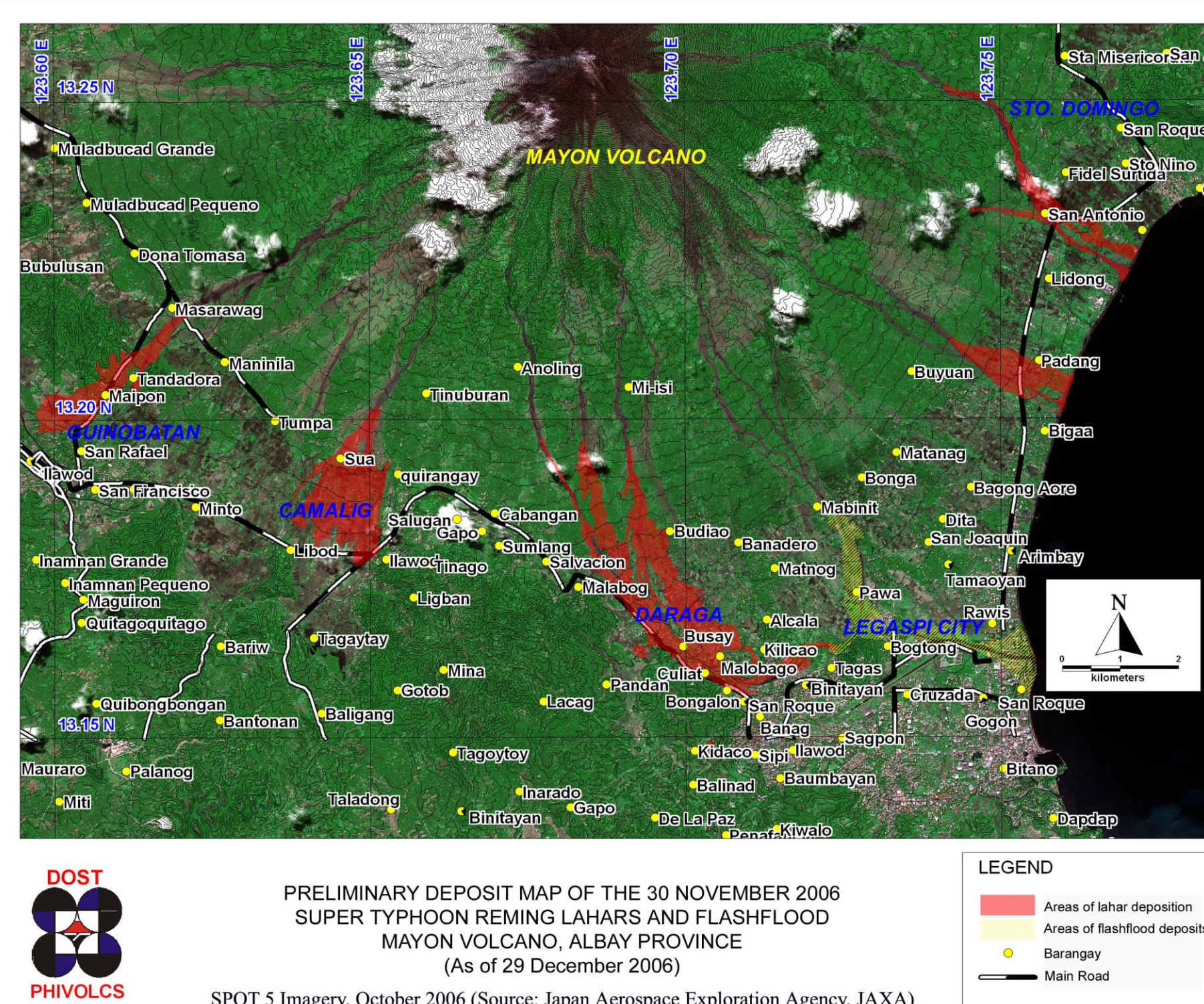


Figure 2: lahar inundation (Source: PHIVOLCS, 2006: 4, fig. 2)

4. Anticipation of the Typhoon Reming lahars

Community representatives across five barangays noted prior experience of lahars but were still surprised by the Reming event, whilst others (particularly further downslope of the volcano) had no recollection of previous lahars. Communities had no memory of an event as devastating as this and therefore had no contingency plan for addressing it. This is in spite of a history of deadly post-eruption lahars (see Ramos-Villarta et al., 1985):

- o 1875 lahars that killed 1500 people (most similar event to the Reming lahars)
- o 1981 tropical storm lahars that killed 40 people

Evidence suggests that residents (and some key stakeholders) perceived that Typhoon Reming would be little different to their recent experience of typhoons:

'they were warned to get out of the way, many people did not and what they said was: "well we got warned during Typhoon Milenyo too and nothing happened...so we just assumed it would be the same"' (Volcanologist)

'we stayed here...because...we know that it's only a regular typhoon...we used to it' (Female, 47, former resident of Barangay Tagas)



Figure 3: lahar devastated homes in Barangay Binitayan (Source: author's own, October 2012)

Experiences of earlier disasters impinged on residents (and some key stakeholders) ability to perceive that hazards familiar to them (e.g. typhoons) might be larger and able to trigger devastating secondary hazards they had not experienced in the past. The effect was a 'normalisation bias' (Johnston et al., 1999), meaning communities were perhaps less attentive to warnings. For those who did prepare, their actions reflected their concern with the effects of wind, rather than lahar: *'the poor people tend to evacuate to the big...concrete houses owned by the rich people...but the Mayon lahar destroyed all the houses'* (local NGO representative, Legazpi City) (e.g. Figure 3).

Furthermore, communities may have not anticipated large lahars without a volcanic eruption. PHIVOLCS volcanologists noted that they had to reassure residents that the volcano had not erupted and a few residents interviewed (as well as two key stakeholders) attributed the Reming lahars to the effusive eruption of Mayon in July-August of that year. However, the volcanologists observed that this eruption instead alleviated risk by capping pyroclastic deposits and shielding Legazpi City. One member of local government also recalled some residents confusing lahar with slow-moving lava and, consequently, assuming they could delay their evacuation.

Of those communities who discussed warnings, the majority claimed not to have received an alert specific to lahars. Part of the problem was owing to the fact that typhoon triggered lahars overlap the mandates of both the weather bureau (Philippine Atmospheric, Geophysical and Astronomical Services, PAGASA) and volcanic observatory (PHIVOLCS). This problem was compounded by the fact that it was difficult to communicate evacuation orders owing to damage inflicted to power lines by an earlier typhoon (Typhoon Milenyo, September 2006).

5. Lessons for community-based DRR

The case study demonstrates that:

- **Disasters can be the consequence of unanticipated manifestations of known hazards** – key stakeholders and a number of communities were aware of lahar risk, but did not anticipate that lahars of such magnitude would be triggered by Typhoon Reming.
- **Community knowledge alone is insufficient for anticipating disasters.** Consequently, NGO approaches to community risk assessments need to incorporate knowledge in addition to that provided by the community.
- **The perception of lahars as a 'volcanic' hazard can lead to confusion over monitoring and warning for these when they occur without an eruption.** This confusion extends to communities' understanding of their causes and, as such, their ability to anticipate the occurrence of lahars.
- **It is, therefore, important for communities to have a general understanding of the causes of hazards,** as well as the differences between volcanic hazards (e.g. lahar and lava flow), in order to help them anticipate when these might occur.
- **Previous disasters can increase future risk by increasing vulnerability and influencing risk perception.** They can also sometimes reduce future risk (e.g. the 2006 lava flow capping pyroclastic deposits).
- **There is a need for community-based monitoring and warning,** rather than solely relying on centralised approaches. This is currently being addressed by the local government.
- **Community-based hazard assessments must account for the interrelations between hazards** – aggregating individual risks is not enough; the majority of the typhoon related deaths were owing to the lahars.
- **Anticipation needs to be strengthened in order to forecast secondary hazards and their magnitude.**

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