

Research paper

Perception of volcanic eruption as agent of change on Merapi volcano, Central Java

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Abstract

Events like volcanic eruptions challenge equilibrium models of nature. This is a study of the perceptions of eruptions as agents of change, taking Mt. Merapi in Central Java as a case study. Villagers living on Merapi have developed a system of religious belief, and a system of agro-ecological practices, that ‘domesticates’ the volcanic hazard. The villagers view eruptions as agents of change, often change for the good. The Indonesian government, on the other hand, technologizes and exoticizes the volcanic hazard, and conceptually and materially separates it from the realm of civil society. The state focuses its attention exclusively on intermittent moments of heightened volcanic activity, whereas the villagers focus their attention on the much longer interim periods when there is little or no such activity. This case study shows that not just the perception of risk, but the very concept of risk itself can vary. The cultural production of such concepts co-evolves with natural patterns of perturbation. © 2008 Elsevier B.V. All rights reserved.

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1. Introduction

Geological perturbations have long posed the archetypal challenge to equilibrium-based views of the world. One of the most important modern examples of this challenge was the great Lisbon earthquake of 1755, which claimed at least 60,000 lives (Chester, 2001). The seemingly random devastation of the earthquake was seen as the greatest challenge to the reason and order of the enlightenment – and to belief in a divinely ordered and harmonious world – since the fall of the Roman Empire. In its wake Voltaire (1977/1756) penned his “Poem Upon the Lisbon Disaster”, (literally an inquisition of God), in which he asks why Lisbon should have been singled out for destruction: “Did wiped-out Lisbon’s sins so much outweigh Paris and London’s, who keep holiday?” In the following century, while belief in a divine order declined, belief in an equally stable natural order arose, and it was an order that was still troubled by geological perturbation. Thus, in 1864, in his pioneering

environmental work “Man and Nature”, George Perkins Marsh wrote:

“Nature, left undisturbed, so fashions her territory as to give it almost unchanging permanence of form, outline, and proportion, except when shattered by geologic convulsions; and in these comparatively rare cases of derangement, she sets herself at once to repair the superficial damage, and to restore, as nearly as practicable, the former aspect of her dominion.”

Earthquakes (Marsh also refers to the 1755 Lisbon quake) and volcanic eruptions are the defining challenges to the permanence of Nature. As examples of how such cases of “derangement” are “repaired”, Marsh presents accounts of the gradual re-vegetation of Mts. Aetna and Vesuvius following eruptions. He writes, “The eruptive matter of volcanoes, forbidding as is its aspect, does not refuse nutriment to the woods.”

Marsh’s “Man and Nature” was a pioneering effort to demonstrate that the aggregation, over time, of the simple, everyday practices of human existence can profoundly change the physical geography of the earth. Marsh further argued that

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“man has shown he is not altogether impotent to struggle with even these mighty servants of nature”, “the greater and more subtle natural forces, and especially of geological agencies” (1965/1864:459). He discusses how the sinking of deep wells may vent the destructive energy of earthquakes, and how certain types of building construction (like the town treasury of Lisbon in 1755) are able to withstand this energy (459–460). Marsh goes on to say, “No physicist, I believe, has supposed that man can avert the eruption of a volcano or diminish the quantity of melted rock which it pours out of the bowels of the earth; but it is not always impossible to divert the course of even a large current of lava.” He then lists multiple examples dating back to the seventeenth century of lava flows in Italy being diverted by human efforts. After reading Marsh’s book, Charles Lyell said he (Lyell) had erred in supposing man’s geological impact was no greater than that of brute animals.

Marsh’s example of constructing lava-diverting ditches reflects what was essentially an equilibrium-based view of stasis and disturbance. The equilibrium model assumed stasis in both society and environment, and anything that disrupted this was problematized. Eugene P. Odum’s (1971) work in ecology was particularly associated with this approach. This model has been in retreat, within science, for a generation. Worster (1990:11) writes that “Odum’s ecosystem, with its stress on cooperation, social organization, and environmentalism” was replaced with an image of “nature characterized by highly individualistic associations, constant disturbance, and incessant change”.¹ The general shift in science toward a non-equilibrium model has been associated with a seismic shift in the approach to the study of natural disasters.

A generation ago, the study of natural hazards and disasters focused on natural impact, human response, and prospects for mitigation — but did not problematize any of the key concepts involved, even in cross-cultural contexts. One of the first to critique this approach was Watts, who wrote (1983:231) “I argue that hazards research has been framed by concepts and assumptions which carry a historically specific view of nature, society and man and hence, by extension, of the relations between them.” In particular, Watts said, a community’s capacity to cope with hazards is embedded in and thus a function of its relations of production; and if the latter are weakened, then so is the former. Indeed, he says, hazards are “redefined by the transformation in the social relations of production” (Watts, 1983:252). Since then an alternate approach has developed which emphasizes political-economic study of the concept of disaster itself (exemplified by the work of Karl Hewitt (1983) and Wisner (1993)). This field has also stimulated a sub-field of anthropological or ethnographic study of responses to natural hazard (Oliver-Smith and Hoffman, 1999). A prominent theme in much of this literature is the difference in the way that natural hazards and disasters are perceived by the proximate communities versus central governments. This

field has not contributed as much as might be expected to the vast literature on indigenous knowledge (Ellen et al., 2000; Sillitoe et al., 2002), however (cf. Waddell (1975) and Paul (1984) as exceptions), which perhaps reflects the abiding tendency to view disaster and disaster response as outside the parameters of the everyday construction and deployment of knowledge.

I propose here to compare and contrast views of volcanic hazard on Merapi volcano in Central Java, Indonesia. The local communities on the volcano have developed a system for living on its slopes and conceptualizing its hazards, which is based on naturalizing, familiarizing, and ‘domesticating’ the threat from the volcano. The state, in contrast, technologizes and thereby exoticizes this threat. Whereas the villagers see eruptions as routinized catalysts for productive change; the state sees them as episodic threats to well-being. I will begin by discussing Merapi volcano, the adaptation to it by local communities, involving the ‘domestication’ of hazard in everyday practices and beliefs, and the contrasting stance of the state. Then I will discuss the last major eruption, in November 1994; the villagers’ view of this eruption as a positive change agent; and the negative, symbolic loading of such perturbation for the state. I will conclude with a discussion of the implications of this analysis for our understanding of natural hazards and perceptions of risk.

This analysis draws, first, on field data that I gathered on Merapi volcano during a study that I conducted there from January 1982 through May 1985, in collaboration with students and faculty in the Department of Anthropology at Gadjah Mada University in nearby Yogyakarta. The site of this and subsequent study was Turgo (in the sub-district of Pakem), today a hamlet of about 90 households, down from a peak of about 150 just prior to the 1994 eruption. For many years this has been the highest remaining inhabited village on the southern slope of Merapi. Lying at 984 m above sea level, Turgo is approximately 8 km from the summit and crater of Merapi, which rises to 2962 m above sea level. My initial study focused on the system of agriculture and animal husbandry practiced on the slopes of the volcano, and it included daily and long-term monitoring of the activities of a sample of village households (Pranowo, 1985; Hidayana, 1987). Particular attention was paid to the impact of volcanic hazards on this system of resource management and on the local body of knowledge for comprehending and managing these hazards (Triyoga, 1991). The current analysis also draws on data gathered in the wake of the major eruption of Mt. Merapi on 22 November 1994, concentrating on the interpretation of this eruption by the wider Indonesian society (Dove, 2007). This included a detailed content analysis of coverage of the eruption and its aftermath in major local and national newspapers following the eruption, as well as follow-up fieldwork in the study community. Analysis of more recent changes draws on data gathered over the past 2–3 yr in collaboration with Bambang Hidayana, currently on the faculty of Gadjah Mada.

2. The ‘culture of hazard’

There is a marked difference between the local communities on Merapi on the one hand, and on the other hand the

¹ Most recent analyses of the post-equilibrium shift, however, note the anomalous evidence of scientific work early in the twentieth century, a good one-half century before the later repudiation of the equilibrium model, of equally outspoken critiques of it (Scoones, 1999; Jelinski, 2005; Wallington et al., 2005).

Indonesian government, in how they situate volcanic hazard with respect to everyday life: whereas the local communities incorporate this hazard into everyday life (thus ‘domesticating’ it), the government firmly separates the two.

2.1. Merapi volcano

A high proportion of the 175,000 human deaths due to volcanic eruption over the past two centuries worldwide occurred on the island of Java (Chester, 1993: 271). There are 129 volcanoes on Java, and the most active of these is Gunung Merapi (‘the Fire Mountain’) in Central Java (Fig. 1). Historical records show that Merapi has had at least thirteen major eruptions with human casualties since 1006. However, since all but one of these recorded eruptions took place in the last one-third of this period (namely, since 1672), the poorer records from earlier times are probably disguising a much higher toll. The deadliest eruption in historical times occurred in 1672, leaving a reported 3000 people dead.

One of the most feared aspects of Merapi, and something that is characteristic of this type of volcano, is the eruption of a type of pyroclastic flow consisting of revolving clouds of superheated gases. Called *ampa’-ampa’* or *wedhus gembel* in Javanese and *awan panas* in Indonesian (and *nuée ardente* in the international literature), these clouds descend the slopes at

speeds of 200–300 km/h, have temperatures of 200–300 °C and present a far greater threat to life and limb than the much less frequent and slower-moving rivers of lava. Villagers on the slopes of Merapi commonly speak, indeed, of only two volcanic hazards: these heated gases, and the mixtures of ash and water called *lahar dingin* ‘cold lava flows’, which can also descend the slopes at great, destructive speed.

The last major eruption of Mount Merapi, on 22 November 1994, consisted of a gas cloud that rapidly traveled 6 km down the southern slope of Merapi following the Boyong riverbed and 4 km down the south-east slope following the Krasak riverbed (Fig. 2). The inhabitants of a dozen villages on the southern and southeastern slopes fled the cloud on foot down the mountain. Of these, fifty-six died on the spot or subsequently of their injuries and 4452 were evacuated by the government to refugee camps further down the mountain. Turgo, which had not been hit by an eruption within recorded history, was the hardest hit village on this occasion, with over 20 fatalities among its population.

2.2. Turgo Village: beliefs and practices

The villagers of Turgo believe that there is another world within the crater of Merapi, which they characterize as parallel to their own, and which they believe to be inhabited by *baureksa*

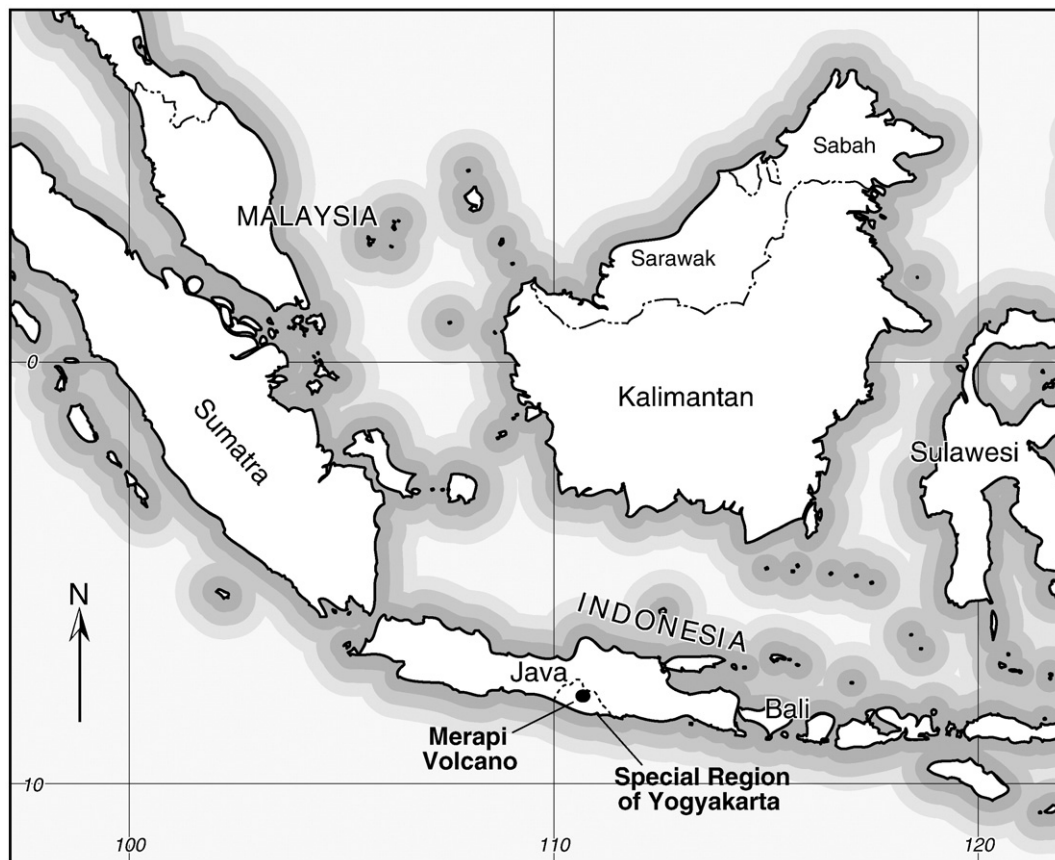


Fig. 1. Location of Mt. Merapi in Central Java.

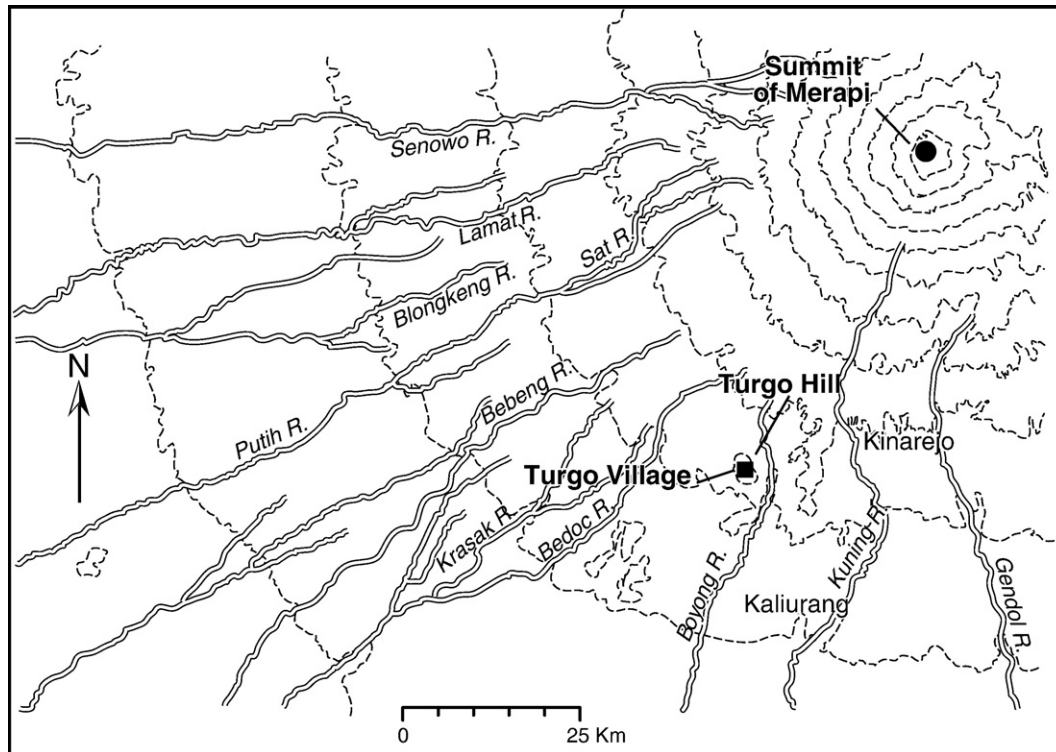


Fig. 2. Location of the study site on the southern slope of Mt. Merapi.

“spirits.”² In many respects ‘life’ in Merapi’s crater is thought to resemble the everyday life of the Javanese. For example, the Turgo villagers, in whose own lives animal husbandry looms large, believe that the volcano’s spirits keep both horses and pigs (the latter being the wild pigs [*Sus scrofa milleri*] that are abundant on Merapi’s slopes). The villagers believe that the spirits graze their pigs in the villagers’ own fields and that they graze their horses on the highest grasslands of Merapi. These grasslands are said to belong to the spirits, their grasses are said to be reserved for the spirits’ livestock, and they are proscribed for human use. The villagers say that the spirits actively manage these grasslands (the highest and thus most often affected by volcanic activity), citing as proof the fact that they are rejuvenated by every eruption. Major eruptions of Merapi are seen as manifestations of the mundane, day-to-day activities of the spirit palace. The villagers believe that house construction and cleaning is scheduled in the Merapi palace during each *Bulan Sura*’ (the first moon of the Islamic calendar) and the dirt and waste produced by these activities is ejected as (what the villagers perceive to be) *lahar*, ash, and gas clouds (cf. Triyoga, 1991).

Just as volcanic activity is expressed in an idiom of everyday activity, so too is personal hazard (cf. Hewitt, 1997:46). Turgo villagers express the threat of volcanic hazard as a feeling of getting lost, being confused, and being ‘invited’ to go away to the world within Merapi. The villagers say that those who try to

lead them away while in this state of loss and confusion are *wewe*, female spirits who appear to them as relatives or close friends. The feeling of going off with the *wewe* is said to be like “the feeling of going home to one’s own village — whereas in fact you are going continually upwards [toward the crater, and the home of the *wewe*].” Two stories told by the villagers of Turgo about people who got ‘lost’ on the volcano are as follows:

- (1) “This is a story of someone who went to the market to buy rice cakes, the seller did not speak; when he returned to the village, the rice cakes turned out to be flat rocks.”
- (2) “Someone wanted to buy seed rice, got lost, and it turned out that what he bought was thorns.”

These stories and associated beliefs simultaneously emphasize both the familiarity and the ‘otherness’ of the volcano. Writing of similar beliefs in the Philippines, Bankoff (2004: 96–97) states:

“The device of investing hazard with personality, of anthropomorphizing the event, can be seen as an important means of maintaining cultural resilience in a society that experiences frequent disasters caused by natural hazards. It is a form of resilience because it represents an attempt by people to come to terms and deal with such phenomena by reducing ‘the awesome and incomprehensible to something prosaic and simplistic’ and so permits its incorporation within the structure of people’s everyday cultural construction of reality.”

The domestication of volcanic hazards on Merapi is important because of the material, economic adaptation to the volcanic environment that it helps to sustain. The key to this adaptation is grass to feed cattle. Turgo, along with other

² Cf. Schlehe (1996:404): “The residents have their own perceptions about the dangers of Mount Merapi. Their belief in the spirits and the rituals related to these spirits provide them with a subjective sense of security and strengthen their resistance to the government’s resettlement policy.” There is increasing recognition of the importance of studying religious beliefs concerning natural hazards and disasters (Chester, 2005).

highland communities (cf. Hefner, 1985 on East Java), never fit the stereotype of a Javanese village surrounded by proximate, intensively managed, irrigated rice terraces. Up until the beginning of the twentieth century, Turgo's inhabitants cultivated maize and tubers in forest swiddens and grazed cattle on open rangelands. Colonial Dutch closure of Merapi's upper slopes for state forestry at the end of the nineteenth century forced the people living on the volcano to relocate their villages further down its slopes and to shift from this extensive system of land use to a more intensive one. The latter, which persisted up to the time of the 1994 eruption was based on intensive inter-cropping of maize, sweet potatoes, and various secondary food crops in permanently cultivated dry fields (called *tegalan*) located adjacent to the down-slope villages.

Cattle, now no longer free-grazing but stall-fed, were critically important to this system of agriculture, chiefly for their production of manure, which maintained the fertility of the annually cropped fields. The Turgo villagers in fact explicitly state that their ancestors replaced the function of the former swidden forest fallow with manure. Husbandry of the stall-fed cattle, in turn, depended on the exploitation (especially during the dry season, when grass resources in the vicinity of the village become inadequate) of the grasslands located up-slope, in the area that was officially closed off as state forest (cf. Blaikie, 1985b). Gathering these grasses is labor intensive: the grasslands are a 60–90 min walk from the village, it takes another hour or so to cut the grasses and then another hour to carry a 55–60 kg bundle of cut grass back to the village. These labor costs restrict this activity to times when there is no intensive work in the cultivated fields by the village.

The up-slope grasslands, which include a great deal of *Imperata cylindrica*, are maintained as such both by daily cutting by the villagers and by periodic scorching by hot gas clouds erupting from the crater, both of which retard the growth of trees (cf. van Steenis, 1972). *Imperata* has a competitive edge in such an environment because its extensive below-ground root system and fast rate-of-growth favor its rapid regeneration after being burned. The villagers themselves say that eruptions favor grasslands as opposed to forests on Merapi's upper slopes (cf. Blong, 1982:186). They also say that periodic ash falls help to keep these grasslands unusually productive.³

Given the way that the Turgo villagers have adapted the very basis of their agricultural economy to the volcanic environment, given the way that they not only naturalize but utilize volcanic perturbation, they could be said to have a 'culture' of volcanic hazard. As Bankoff (2004:111) has written of the Philippines, "In some societies, natural hazards occur with such historical frequency that the constant threat of them has been integrated into the schema of both daily life and attitude to form what can be called 'cultures of disaster'." An example of such a culture is the reliance of Bangladeshi farmers upon the "normal" annual flooding of the country's rivers (Paul, 1984; cf. Zaman, 1991).

³ When the volcano is in an active phase, there may be multiple small eruptions of gas or minor ash falls in a single day. Cf. Schlehe (1996:405) on beliefs concerning the role that the natural cycle of eruptions plays in the fertility of both human and spirit world.

2.3. Indonesian government

This local 'culture of hazard' on Merapi is not shared by the Indonesian government. The government views the volcanic hazard as something beyond the normal social order of things, as something to be kept separate from society. This is graphically reflected in its central policy tool for dealing with the villagers living on Merapi, namely resettlement.⁴ Governmental resettlement efforts spike upwards after every major eruption. For example, an eruption in May 1961, which destroyed 109 homes and killed five people, was followed by the transmigration of 1905 villagers (*Suara Merdeka*, 9/12/94). In 1978, in the wake of a smaller eruption of hot gases and ash, the government tried but failed to resettle the villagers of Turgo and settled with officially "erasing" the village (*dihapus*) from government maps.⁵ The eruption in November 1994, with a death toll exceeding anything experienced on Merapi since 1930, led to a resurgence of government efforts to remove people from Merapi's slopes — but with limited success.

The Merapi villagers display remarkable unanimity in their opposition to resettlement. In the aftermath of the 1994 eruption, 7962 households in villages lying in the danger zone were interviewed and less than 1% expressed any interest in transmigrating (*Suara Merdeka*, 7/12/94). Many villagers saw the government resettlement program as just another sort of hazard, and they preferred the hazard that they knew to the one that they didn't (cf. Schlehe, 1996:403). As one villager told the press: *Jika ia harus mati disebabkan oleh bencana Merapi, itu sama dengan mati ngrungkebi negara* "If you have to die because of the hazards from Merapi, it is the same as dieing from giving up to the state" (*Kedaulatan Rakyat*, 8/12/94; cf. Pannell, 1999). As an alternative to transmigration, the people of Turgo were offered the option of moving into a newly-built resettlement hamlet called Sidomoro, located about 10 km down the mountain from their existing village. The houses in Sidomoro, built with public donations, were relatively well-built, and those who settled there received considerable state aid (whereas no aid was given to villagers who returned to Turgo). However, although some villagers initially opted to move into Sidomoro, most returned to Turgo, beginning the month after the 1994 eruption. Today, there are approximately 90 households in Turgo and just 50 in Sidomoro, and the latter number has steadily declined as more and more villagers returned to Turgo.⁶

⁴ See Belshaw (1951) for an early assessment of resettlement in the wake of a volcanic eruption (in Papua New Guinea) by an anthropologist.

⁵ The ability to erase a village in law but not fact reflects the fact that, as with resettlement programs elsewhere in Indonesia, the government's actual abilities to move populations about typically fall far short of its announced policies and programs (Harwell, 2000b).

⁶ Notwithstanding its policy of resettling villagers off of the mountain, the government has extended support in recent years to mining of volcanic sands (which has long been an important extractive industry on the mountain) and also to newer and more lucrative developments in tourism, agri-business, and park management. Critics of government resettlement policy see such developments, which are no less vulnerable to volcanic hazard than the existing community lands, as raising questions regarding government motives (Schlehe, 1996:404).

The government has developed, with the assistance of international bodies concerned with volcanology, a world-class scientific service devoted to research on Merapi, monitoring of its activity, and dissemination to the public of warnings (Chester, 1993: 292). The government Volcanology Service has mapped out the zone judged unsafe for human habitation, with sub-rankings from 1 to 3 (from most to least dangerous). The service has also developed a ranking system for the day-to-day condition of the volcano, with current rankings routinely publicized in the environs of the volcano. From least to most dangerous, these are: *Aktif Normal* ‘Normally Active’, *Waspada Merapi* ‘On Guard [for] Merapi’, *Siap Merapi* ‘Prepared [for] Merapi’, and *Awasi Merapi* ‘Beware Merapi’. Neither of these classificatory schemes, neither the spatial one nor the temporal one, relate to the local system of knowledge in the communities on the volcano — which is remarkable, given the ancient and rich tradition on Java of folk observation of volcanic activity. The government’s schemes amount to an effort to technologize, exoticize, and thereby appropriate, knowledge of the volcano. The Volcanology Service’s ongoing effort to assert its authority over the volcano is reflected in its periodic press briefings (drawing data from its monitoring stations on Merapi’s slopes), an example of which follows:

Kemarin, tidak terjadi gempa vulkanik, gempa low frequency, maupun gempa tremor. Hanya terjadi gempa fase banyak 2 kali dan guguran lava 88 kali.

Yesterday, there were no volcanic earthquakes, low-frequency earthquakes, or earth tremors. There were only two multi-phase earthquakes and 88 discharges of lava. (Suara Merdeka, 8 December 1994)

These briefings not only emphasize the government’s understanding of, and thus to some extent authority over, the volcano, but their use of scientific language emphasizes the exclusivity of this authority in representing the activity of the volcano to the public.⁷

3. Natural hazard as agent of social change

Because government and local communities view the relationship of volcanic activity to everyday life differently, they also view differently the implications of such activity for social change.

3.1. Post-1994 eruption adaptation

Merapi’s eruptions have historically proved to be sources of change, sometimes for ill and sometimes for good. For

example, the November 1994 eruption led to the emergence of a radically different agricultural economy, with a shift in balance between subsistence-oriented and market-oriented activities (Dove and Hudayana, 2008). Whereas the villagers of Turgo had previously cultivated annual food crops for their own consumption, now they concentrate on the production of products for market sale. These include fodder grasses, fruit, volcanic sands (for the urban construction industry), fuelwood (cf. Smiet, 1990) and, of most importance, milk and meat from dairy cattle. The market proceeds from these products are used to buy rice which has replaced maize as their staple food grain. After the 1994 eruption, as before, fodder remains the key to the agricultural economy of Mt. Merapi; but whereas fodder grasses were formerly at best semi-managed, now one-half of the annual grass production of Turgo actually comes from planted and cultivated grasses.

These changes in the ago-ecology of Turgo have dramatically improved the villagers’ livelihoods. Since the eruption, Turgo has become the foremost producer of milk in its district. The average Turgo villager now has an annual income equal to or (in the case of those who also sell a lot of fruit and fuelwood in addition to milk) greater than the national average (cf. Lavigne and Gunnell, 2006:90). The increasing household income is reflected in improvements in housing: *rumah tembok* “masonry houses” have grown from just over 20% in 1987 to almost 50% at present. In addition, houses are being improved with glass windows, plaster walls, flooring, and electricity. Another measure of improved livelihoods is higher levels of schooling. Many educated children look for work outside Turgo and send back money to invest in cattle. The growth in prosperity also is reflected in the development of non-farm economic activities like food stalls and employment in commercial transport and mountain/tourism guides. The villagers of Turgo themselves summarize these changes by saying that the 1994 eruption ushered in what they call the *jaman aiyem* “untroubled age”.

3.2. Volcanic eruption as agent of change

Post-eruption environments (e.g., of Krakatau) were long favored by scientists for studies of ecological succession, based on the perception that volcanic eruptions created a blank slate and so whatever came next was created from “whole cloth” (e.g., Tagawal et al. 1985). The villagers on Merapi also see eruptions as important agents of change. They commonly talk about the changes brought about by eruptions, in particular changes in flora and fauna on the mountain. In village oral histories on Merapi, specific, dated eruptions play the same role that is played in the histories of other Indonesian communities by political succession (e.g., World War II, the Soekarno era, the communist putsch, the rise and fall of Soeharto, etc.). Because of the way that eruptions may jumble existing ecological and social relations, they can bring about “clean breaks” with the past, which create new opportunities and makes major innovations in socio-ecological relations possible, as was the

⁷ Keeler (1988:100) makes a similar point in his analysis of government coverage of the total solar eclipse in Java in 1983: “By means of language, the government embraced the eclipse, or attempted to embrace it, within its national project, and to make of it not a reflection upon the government, but yet another of that authority’s many expressions.”

case following the 1994 eruption.⁸ Such changes are dependent not only on the eruption, however, but also on what is happening at the same time in the wider world, which included, in the case of the 1994 eruption, the decline of the Soeharto regime (he was forced from office in 1998) and the regional monetary crisis (of 1997–1998). It might be more accurate, therefore, to call volcanic eruptions not agents of change, but ‘catalysts’ of change, as Blong (1984:180) does (cf. Oliver-Smith, 1996): “Eruptions, rather than causing such changes, act as catalysts, altering the rate at which adjustments in social and political institutions occur.”⁹ By accelerating rates of change, eruptions may challenge socio-ecological systems to the point that they undergo radical change (this is analogous to what Holling et al. (1995) term the “flipping” of an ecosystem from one state to another as the result of a major disturbance).

The association of volcanic eruptions with radical social change has traditionally been threatening to state rulers in the region. In Java and, indeed, throughout Southeast Asia (Adas, 1979), perturbations in the natural realm have long been interpreted as presaging perturbations in the social/political realm (Anderson, 1972; Harwell, 2000a). The history of Java is replete with claimed examples of this: the first recorded eruption of Merapi, in 1006, is popularly credited with toppling the kingdom of Mataram (whose capital lay where Yogyakarta is today), driving the Hindu kingdom to Bali, and precipitating the Islamicization of Java (Decker and Decker, 1997). The court chronicle of the later 16th–18th century state of Mataram, the *Babad Tanah Jawi*, describes the circumstances of the fall of king Amangkurat (1645–1677) as follows (Moertono 1981:74):¹⁰ “...sun and moon eclipses occurred frequently; rain was falling out of season; a comet was seen every night. Ash-rain and earthquakes [occurred]. Many omens were seen. There were signs that the kingdom was facing ruin.” Adas (1979:140) notes that the revolt of Dipanagara (a Yogyakarta prince) against the Dutch in 1825–1830 was preceded by “famine, cholera epidemics, and volcanic eruptions”. Kartodirdjo (1966:66–67,166–168) suggests that the 1888 peasant revolt against the Dutch in Banten, northwest Java, was influenced by both the prophesy and occurrence of human and cattle epidemics, earthquakes, and the eruption of Krakatau in 1883. Keeler (1988:98) links the 1965–66 communal violence on Bali to the eruption of Gunung Agung in 1963.

Continued state sensitivity to natural perturbations, even in the modern era, is reflected in the magnitude of investment by the government of Indonesia in volcanic research and monitoring (Chester, 1993: 292),¹¹ which is not commensurate with the modest toll in life and property due to volcanic activity, compared with, for example, malnutrition and infant mortality, or even other natural perturbations like fire and flood. This incommensurability reflects the fact that volcanic activity is symbolically loaded in a way that other natural perturbations are not, and death and destruction due to volcanic activity are ‘privileged’ in a way that other deaths are not (including those, for example, in the transmigration sites to which evacuees are sent¹²). Evidence of state investment of symbolic capital in the activity of Merapi and in its ability to understand and control it consists in the amount of high-level political attention that the 1994 eruption garnered (which, again, greatly exceeded that for equal numbers of casualties from other, more mundane causes of death). This attention included early and close involvement in aid efforts by then-president Soeharto himself, including a visit to the evacuee camps. Sensitivity on this issue was also reflected, in the aftermath of the eruption, in the public debate as to whether or not the government Volcanology Service had provided adequate warning of the eruption.¹³ State anxiety about the eruption was validated in the popular mind by the fact that Indonesia was subsequently shaken by financial, political, and environmental crises, culminating in the collapse of Soeharto’s three-decade-long reign.¹⁴

4. Conclusions

The adaptation of the Turgo villagers to a volcanic environment can be compared with Marsh’s earlier-mentioned examples of human diversion of lava flows. The latter epitomize a modern stance of resisting nature (they are included in a section that Marsh himself entitles “Resistance to Great Natural Forces”). The stance taken toward the forces of nature in Turgo is much more one of collaboration than resistance. Exceptions to this stance are rare, one example being a query to me from the headman of Turgo following the 1994 eruption of Merapi. He had seen “bunkers” in television coverage of the first Gulf War and he wanted to know whether something of that sort could be erected in Turgo to better

⁸ Cf. Lavigne and Gunnell (2006:97) on the opportunistic responses to natural perturbation in contemporary Java: “Given this chronic state of dis-equilibrium, our short-term data is confirmed by the longer-term evidence that human impacts and natural phenomena are often inextricably linked, humans being opportunistic in their attitudes to natural variability: El-Niño-related fires are used to expand upland agriculture; juvenile volcanic debris are soon co-opted to agricultural land; prograding deltas, supplied by sediment loads sourced by soil erosion in the hinterland, are developed into polders; river channel banks are deliberately eroded by farmers to extend agricultural land in floodplain (a practice called *ngagugur*).”

⁹ Blong (1984:180–184) presents brief case studies of how volcanic eruptions accelerated processes of westernization at four sites in less-developed countries.

¹⁰ Other examples of volcanic eruptions occurring at key moments in Javanese dynastic politics are cited in Raffle’s (1817/1978) compilation of court histories.

¹¹ See Harwell’s (2000a) analysis of the linkage between Indonesia’s internationally embarrassing fires in 1997/98 and its commitment to the development of remote-sensing technology.

¹² Laksono (1988) argues that mortality rates on Merapi, the volcanic hazards notwithstanding, compare favorably with the rates in the government’s unhealthy transmigration sites.

¹³ The Minister of Mining and Energy, who has authority over the Volcanology Service, complained to the National Assembly that he was slandered by a political cartoon that depicted a volcanologist asking, “What’s happening, what’s happening?” while villagers fleeing the eruption ran past him (Suara Merdeka, 1 December 1994).

¹⁴ Wisner (1993:137n11) has compiled an impressive list of contemporary governments that have fallen as the direct result of natural disasters (cf. De Boer and Sanders (2002) on the “far-reaching” impacts of volcanic eruptions). Less studied but equally intriguing is the relationship between natural disaster and the waxing and waning of local societies (cf. Blong (1982) on the Enga of Papua New Guinea).

enable them to withstand future eruptions. For the most part, such a “bunker mentality” does not characterize the stance of the Turgo villagers toward Merapi, with which, to the contrary, they are intimately engaged on a daily basis on both spiritual and material (agro-ecological) terms. This engagement is, moreover, not static but continually evolving.¹⁵

A distinguishing feature of community versus state gaze toward Merapi is the extent to which it focuses on periods of hazard versus periods of non-hazard. The attention of the state is highly intermittent and tied to hazard events. Immediately following (and often also leading up to) major eruptions of Merapi, there is a spike in state interest and intervention. This is when state pressure to resettle or transmigrate villagers is most intense, rather quickly receding in the months following. This is almost the inverse of the pattern of community attention. Villagers take their chances with the occasional serious eruption, and in the worst cases they can evacuate their communities for a few days; but it is the period between eruptions that consumes their attention. Their daily agro-ecological practices (and attendant evasion of state regulations) are most responsible for enabling the villagers to adapt to Merapi’s environment. In contrast, between eruptions the villagers almost disappear from state view. In the case of Turgo, which was officially erased from government maps following the 1978 eruption, the people are quite literally, officially invisible during these interim periods (they exemplify the ‘homo sacer’ of Agamben (1998), who have biological but not political life). The exclusive state focus on eruptions as the events most determining of the identity and welfare of these villagers produces inappropriate and unworkable policies. This is so, in part, because these policies are premised on an idealized and unattainable equilibrium. As Lavigne and Gunnell (2006:99) write, “Our study has provided some baseline insight into the endemic instability of the Javan environment and hence the inappropriateness of envisaging environmental management policies based on assumptions of steady-state equilibria.”

There is a perceptual, cognitive dimension to the concept of risk on Merapi volcano. Attention to this dimension has often been missing from political ecological studies. In the canonical work of Blaikie (1985a) on soil erosion, for example, the idea and occurrence of soil erosion itself was not problematized (Blaikie, 1999:139–140). Indeed, Bankoff (2004:1100) writes that:

“...there is still a tendency to underestimate the extent to which disasters are also perceptual phenomena, occurrences that take place and shape in people’s minds. The focus on people’s physical, social, economic and political vulnerabilities and their comparable capacities or coping practices obscures just how much these are likewise cerebral events that influence behaviour.”

The analysis here of village and state on Merapi suggests not merely that perceptions of risk can vary, but that the very

concept of risk itself can vary. To simply assert that the villagers perceive less risk on Merapi whereas the state perceives more, does not do justice to the fundamental differences in the ways the two parties perceive the volcano.

Concepts of natural hazard likely co-evolve with the hazards themselves. In geological terms, the Indonesian archipelago is subject to an unusual level of natural perturbation. As Lavigne and Gunnell (2006:97) write, “The ‘normal’ state of nature on Java is to be recovering from the last disaster, not equilibrium and repose.” Thus, Merapi’s eruptions, and the demand for a response by both state and local communities, are not anomalous for the country. Of greatest interest is the way that such natural perturbations and their cultural construction have historically developed in tandem. Adas (1979: 97–98) writes, “The assimilation and transmutation of Hindu–Buddhist concepts produced a heightened sensitivity among the Javanese to stability and tranquility and the disruptive effects of change. It also resulted in a time sense that was based on a belief in the repeated and cyclic creation, decline, and destruction of the universe.”¹⁶ This is the natural and cultural genesis of the view of volcanic eruptions as agents of change, opportunistically embraced by proximate villagers, feared and controlled by the state.

This analysis has some obvious implications for disaster management policy in Indonesia and beyond. In particular, it suggests that policy-makers need to be more attentive to the role of perturbation and change in the social life of communities, how this affects risk perception and management, and how state views of risk are themselves inevitably socially constructed and thus contingent in value and efficacy.

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References

- Adas, M., 1979. *Prophets of Rebellion: Millenarian Protest Against the European Colonial Order*. University of North Carolina Press, Chapel Hill.
- Agamben, G., 1998. *Homo Sacer: Sovereign Power and Bare Life*. Stanford University Press, Stanford, CA.
- Anderson, B.R.O’G., 1972. The idea of power in Javanese culture. In: Holt, C. (Ed.), *Culture and Politics in Indonesia*. Cornell University Press, Ithaca, pp. 1–69.

¹⁵ Watts (1983:239) argues that cybernetic-adaptation may apply to individuals but not to social systems, which are thus not “adaptive” but “accumulative, contradictory and unstable”.

¹⁶ Cf. Lansing’s (2006) analysis of the tension between order and disorder on the Balinese landscape.

- Bankoff, G., 2004. In the eye of the storm: the social construction of the forces of nature and the climatic and seismic construction of God in the Philippines. *Journal of Southeast Asian Studies* 35 (1), 91–111.
- Belshaw, C.S., 1951. Social consequences of the Mount Lamington eruption. *Oceania* 21 (4), 241–252.
- Blaikie, P., 1985a. *The Political Economy of Soil Erosion in Developing Countries*. Longman, New York.
- Blaikie, P., 1985b. Soil slides south. *Inside Asia* 2, 45–47 (Feb./March).
- Blaikie, P., 1999. A review of political ecology: issues, epistemology and analytical narratives. *Zeitschrift für Wirtschaftsgeographie* 43 (3/4), 131–147.
- Blong, R.J., 1982. *The Time of Darkness: Local Legends and Volcanic Reality in Papua New Guinea*. Australian University Press, Canberra.
- Blong, R.J., 1984. *Volcanic Hazards: a Sourcebook on the Effects of Eruptions*. Academic Press, Sydney.
- Chester, D.K., 1993. *Volcanoes and Society*. Edward Arnold, London.
- Chester, D.K., 2001. The Lisbon earthquake. *Progress in Physical Geography* 25 (3), 363–383.
- Chester, D.K., 2005. Theology and disaster studies: the need for dialogue. *Journal of Volcanology and Geothermal Research* 146, 319–328.
- De Boer, J.Z., Sanders, D.T., 2002. *Volcanoes in Human History: the Far-Reaching Effects of Major Eruptions*. Princeton University Press, Princeton.
- Decker, R., Decker, B., 1997. *Volcanoes*, 3rd ed. W. H. Freeman, New York.
- Dove, M.R., 2007. Volcanic eruption as metaphor of social integration: a political ecological study of Mount Merapi, Central Java. In: Connell, J., Waddell, E. (Eds.), *Environment, Development and Change in Rural Asia-Pacific: Between Local and Global*. Routledge, London, pp. 16–37.
- Dove, M.R., Hudayana, B., 2008. The view from the volcano: an appreciation of the work of Piers Blaikie. *GeoForum* 39 (2).
- Ellen, R.F., Bicker, A., Parkes, P. (Eds.), 2000. *Indigenous Environmental Knowledge and its Transformations*. Harwood, Amsterdam.
- Harwell, E.E., 2000a. Remote sensibilities: discourses of technology and the making of Indonesia's natural disaster. *Development and Change* 31, 307–340.
- Harwell, E.E., 2000b. *The un-natural history of culture: ethnicity, tradition and territorial conflicts in West Kalimantan, 1800–1997*. Ph.D. dissertation, School of Forestry and Environmental Studies, Yale University, New Haven (CT).
- Hefner, R.W., 1985. *Hindu Javanese: Tengger Tradition and Islam*. Princeton University Press, Princeton.
- Hewitt, K., 1983. The idea of calamity in a technocratic age. In: Hewitt, K. (Ed.), *Interpretations of Calamity, from the Viewpoint of Human Ecology*. Allen and Unwin, Boston, pp. 3–32.
- Hewitt, K., 1997. *Regions of Risk: a Geographical Introduction to Disasters*. Longman, London.
- Holling, C.S., Schindler, D.W., Walker, B.W., Roughgarden, J., 1995. Biodiversity in the functioning of ecosystems: an ecological primer and synthesis. In: Perrings, C., Mäler, K.-G., Folke, C., Holling, C.S., Jansson, B.-O. (Eds.), *Biodiversity Loss: Economic and Ecological Issues*. Cambridge University Press, Cambridge, pp. 44–83.
- Hudayana, B., 1987. *Tanaman dalam usaha tani subsisten di sebuah desa lahan kering lereng Merapi Yogyakarta (The plants of the subsistence cultivation system of an unirrigated village on the slopes of Merapi, Yogyakarta)*. Sarjana thesis, Anthropology Department, Gadjah Mada University, Yogyakarta, Indonesia.
- Jelinski, D.E., 2005. There is no mother nature — there is no balance of nature: culture, ecology and conservation. *Human Ecology* 33 (2), 271–288.
- Kartodirdjo, Sartono, 1966. *The Peasants' Revolt of Banten in 1888: Its Conditions, Course and Sequel*. Verhandelingen 50. Martinus Nijhoff, The Hague.
- Keeler, W., 1988. Sharp rays: Javanese responses to a solar eclipse. *Indonesia* 46, 91–101.
- Laksono, P.M., 1988. Perception of volcanic hazards: villagers versus government officials in Central Java. In: Dove, M.R. (Ed.), *The Real and Imagined Role of Culture in Development*. University of Hawaii Press, Honolulu, pp. 183–200.
- Lansing, J.S., 2006. *Perfect Order: Recognizing Complexity in Bali*. Princeton University Press, Princeton.
- Lavigne, F., Gunnell, Y., 2006. Land cover change and abrupt environmental impacts on Javan volcanoes, Indonesia: a long-term perspective on recent events. *Regional Environmental Change* 6 (1–2), 86–100.
- Marsh, G.P., 1965/1864. *Man and Nature: or, Physical Geography as Mediated by Human Action*. Harvard University Press, Cambridge, MA.
- Moertono, S., 1981. *State and statecraft in Old Java: a study of the later Mataram Period, 16th to 19th century*. Modern Indonesia Project, Southeast Asia Program. Cornell University, Ithaca, NY.
- Odum, E.P., 1971. *Fundamentals of Ecology*, 3rd ed. Saunders College Publishing, Philadelphia, PA.
- Oliver-Smith, A., 1996. Anthropological research on hazards and disasters. *Annual Review of Anthropology* 25, 303–328.
- Oliver-Smith, A., Hoffman, S.M. (Eds.), 1999. *The Angry Earth: Disasters in Anthropological Perspective*. Routledge, New York.
- Pannell, S., 1999. Did the earth move for you? The social seismology of a natural disaster in Maluku, Eastern Indonesia. *Australian Journal of Anthropology* 10 (2), 129–143.
- Paul, B.K., 1984. Perception of an agricultural adjustment to floods in Jamuna floodplain, Bangladesh. *Human Ecology* 12 (1), 3–19.
- Pranowo, H.A., 1985. *Manusia dan Hutan (Man and Forest)*. Gadjah Mada University Press, Yogyakarta, Indonesia.
- Raffles, T.S., 1817/1978. *The History of Java*. Oxford University Press, Kuala Lumpur, Malaysia. 2 vols.
- Schlehe, J., 1996. Reinterpretations of mystical traditions: explanations of a volcanic eruption in Java. *Anthropos* 91 (4–6), 391–409.
- Scoones, I., 1999. New ecology and the social sciences: what prospects for a fruitful engagement? *Annual Review of Anthropology* 28, 479–507.
- Sillitoe, P., Bicker, A., Pottier, J., 2002. *Participating in Development: Approaches to Indigenous Knowledge*. Routledge, London.
- Smiet, A.C., 1990. Agro-forestry and fuel-wood in Java. *Environmental Conservation* 17 (3), 235–238.
- Tagawal, H., Suzuki, E., Partomihardjo, T., Suriadarma, A., 1985. Vegetation and succession on the Krakatau Islands, Indonesia. *Plant Ecology* 60 (3), 131–145.
- Triyoga, L.S., 1991. *Manusia Jawa dan Gunung Merapi: Persepsi dan Sistem Kepercayaannya (The Javanese People and Merapi Volcano: Perceptions and System of Belief)*. Gadjah Mada University Press, Yogyakarta, Indonesia.
- van Steenis, C.G.G.J., 1972. *The Mountain Flora of Java*. E. J. Brill, Leiden.
- Voltaire, 1977/1756. *Poem Upon the Lisbon Disaster*. Trans A. Hecht. (Original: *Poème sur le Désastre de Lisbonne*). Pemaen Press, Lincoln, MA.
- Waddell, E., 1975. How the Enga cope with frost: responses to climatic perturbations in the Central Highlands of New Guinea. *Human Ecology* 3 (4), 249–273.
- Wallington, T.J., Hobbs, R.J., Moore, S.A., 2005. Implications of current ecological thinking for biodiversity conservation: a review of the salient issues. *Ecology and Society* 10 (1), 15–30.
- Watts, M., 1983. On the poverty of theory: natural hazards research in context. In: Hewitt, K. (Ed.), *Interpretations of Calamity from the Viewpoint of Human Ecology*. Allen and Unwin, Boston, pp. 231–262.
- Wisner, B., 1993. Disaster vulnerability: scale, power and daily life. *GeoJournal* 30 (2), 127–140.
- Worster, D., 1990. The ecology of order and chaos. *Environmental History Review* 14 (1/2), 1–18.
- Zaman, M.Q., 1991. Social structure and process in *car* land settlement in the Brahmaputra–Jamuna floodplain. *Man* 26 (4), 673–690.

Indonesian-language newspaper and magazine articles

- Kedaulatan Rakyat, 1994. *Pengungsi Pulang tak Izin, Dijemput Dandim Sleman*. 8 December.
- Suara Merdeka, 1994. *IB Sudjana Merasa Difitnah dengan Karikatur*. 1 December.
- Suara Merdeka, 1994. *Kali Bebeng, Blongkeng, dan Krasak Banjir Lahar Dingin Gunung Merapi*. 7 December.
- Suara Merdeka, 1994. *Banjir Lahar Dingin di Kali Boyong*. 8 December.
- Suara Merdeka, 1994. *Kegiatan Merapi dan Jumlah Korban*. 9 December.