philippine studies: historical and ethnographic viewpoints

Ateneo de Manila University • Loyola Heights, Quezon City • 1108 Philippines

Hazardousness of Place: A New Comparative Approach to the Filipino Past

Greg Bankoff

Philippine Studies: Historical and Ethnographic Viewpoints
vol. 64 nos. 3–4 (2016): 335–57

GREG BANKOFF

Hazardousness of Place A New Comparative Approach to the Filipino Past

The historiography of the Philippines has been largely bounded by the nation-state, which has defined how its past has been conceived and to whom its peoples are mainly compared. A more transnational environmental history, however, seeks to situate the archipelago within the context of the daily threats that its peoples have to face. This article focuses on the hazardous nature of living in the islands and explores the ways in which Filipinos have adapted to natural hazards as a frequent life experience over time.

KEYWORDS: HISTORIOGRAPHY · PHILIPPINES · DISASTERS · RISK · ADAPTATION

Over forty years ago, Kenneth Hewitt and Ian Burton (1971, 25) talked about the hazardousness of a place as “a relational concept linking man [sic] and his surroundings.” This hazardousness was a function of both the physical event—its predictability, frequency, rate of onset, intensity, extent of impact, and duration—as well as what we would now refer to as the vulnerability and resilience of the affected population in terms of the level of community resources, the structures of society, the preparedness of its response capabilities, and the adaptability of the culture. Hewitt and Burton (1971) pioneered a human-ecological approach that tried to identify what made living in a specific location precarious by considering the sum total of hazards that struck a specific place, the “history” of human adaptation to their impacts, and how people’s perception of risk influenced decision making.

While the study of Hewitt and Burton (ibid.) was confined to a single location (London, Ontario), a later publication attempted to relate hazardousness to different geographical scales—local, national, and global—to delineate a “geography of hazards” (Burton et al. 1978). This approach has been criticized for an overly managerial framework that favored rational decision making over people’s actual responses to hazard (Hewitt 1980), an omission that later theorists have tried to remedy by stressing the antecedent place-specific, multiscalar processes that influence both a community’s vulnerability and resilience (Cutter et al. 2008).

When it comes to thinking about hazardousness, few would refute the designation of the Philippines as such a place; it currently ranks as the second most dangerous country in the entire world to live in (Birkman et al. 2014, 64). Yet this hazardousness of place is seldom acknowledged in the historiography of the Filipino past, which regards geography largely only in terms of the archipelagic nature of the country and the division imposed between lowlands and highlands within islands.[1] Hazardousness of place, however, has played a central role in defining not only the development of cultures within the archipelago but also in linking the islands to a wider world through the shared experience of risk (Bankoff 2003). As shown in this article, Filipinos share a common history of risk with many other peoples across a wide and diverse region that is not confined to any geopolitical region such as Southeast Asia. This hazardousness is in the air, the land, and the sea. From the air, tropical cyclones rip across the country, causing havoc to town and country alike, often accompanied by storm surges that sweep the shoreline clear of human habitation. On land, there are dangers from earthquakes and volcanoes as the archipelago forms part of the western rim of the Pacific “Ring of Fire” and lies just off the northern fringes of the Alpine–Himalayan Orogenic Belt. And off the water come devastating tsunamis that periodically pound coastlines to rubble.

Not all Filipinos, of course, are equally vulnerable to these dangers; geography apportions risk as unevenly within the nation-state as between them. Entire island populations are threatened by typhoons but only coastal residents are exposed to storm surges and tsunamis, while earthquakes and volcanoes only directly affect those who live above faults or in their shadow.

This article outlines the framework of a more geographically rooted history of the Philippines. It attempts to understand the Filipino past not so much in terms of human actions and reactions to one another, whether neighbor or stranger, but by reverting to an older form of narrative that provides a detailed geographical description of a region or regions, a chorography. By extending the concept of hazardousness of place from a location-based term to a category of comparison, it also contributes theoretically to an understanding of the historiography of the Philippines. From this perspective, the archipelago forms part of a much wider and more diverse geographical area than the one usually considered in history books. It is also one that links Filipinos and their past to the pasts of peoples and cultures with whom they share a common history of hazardousness of place. At the heart of this geographical analysis is risk or the exposure of people to the hazards in their environment and how they have adapted to them over time.

Air and the Hazardousness of Place

By focusing on the hazardousness of the air and placing tropical cyclones at the center of analysis, the Philippines is no longer located only in Southeast Asia but also forms part of a wider region whose parameters are established by cyclonic agency. The so-called Great Tonkin Typhoon of 1881, for example, shows how peoples and lands were linked together by the passage of such a storm. Forming out in the western North Pacific in late September, the typhoon tore through the provinces southeast of Manila on Luzon island, “doing much damage” (Selga 1936). Heavy rain in Batangas added “considerably to the damage occasioned by the storm” and caused localized floods that resulted in at least eleven deaths (Dechevrens 1882, 125). The typhoon then headed out into the South China Sea, intensifying over water and wrecking several steamships in its path before curving northward to make landfall on the Tonkin coast of Vietnam in early October. The unprotected port of Haiphong was quite literally washed away as a three-meter high storm surge coursed up the Red River, drowning 3,000 people and transforming "what the night before had been flourishing gardens and rice fields" into "liquid plains" (ibid., 134). The typhoon then lost strength as it tracked over southern China, Korea, and Japan before finally dissipating somewhere out in the North Pacific (cf. Terry et al. 2012). The path of the Great Tonkin Typhoon makes the point that is only too obvious and yet so often overlooked: hazards do not necessarily stop at national borders. The northward tracking curve of the 1881 typhoon perfectly outlines the dimensions of a more transnational and even transregional historical area that links Filipinos to the peoples of Vietnam, China, Korea, Japan, and Taiwan, as well as the island cultures of Micronesia through a common hazardousness of place.

Tropical cyclones whose wind speeds exceed 119 kilometers per hour are among the most destructive of natural hazards, and the western North Pacific is the most active tropical cyclone region (Elsner and Liu 2003). Over a third of all cyclones in the world, on average twenty-five each year, originate in this region (Japan Meteorological Agency 2014). Cyclones generate over the warm waters of the western North Pacific every year between April and December. Early season storms generally form closer to the equator and move in a linear fashion. They carry great amounts of rainwater and can cause serious flooding. Late-season cyclones are often larger, develop further out in the western North Pacific, and have a more northwesterly trajectory. They have been aptly described as "heat-driven machines of enormous destructive potential" (Longshore 1998, 317). Statistically, the densest concentration of typhoon tracks in the world pass through Typhoon Alley, the 1,600-kilometer-wide corridor of mainly open sea that stretches between Manila and southern Japan. The common experience of hazard that the inhabitants of this region experience delimits a zone of comparative enquiry and historiographical interest: not only have people had to find ways to adapt their societies to the perennial threat of typhoons, but the very paths of the storms weave them together with an Aeolian thread.

The histories of tropical cyclones in the western North Pacific prior to the late nineteenth century and the establishment of meteorological observatories, like those at Manila (1865) and Hong Kong (1883), are patchy. Prior records are based on archival materials, and their quality differs markedly from country to country. The most complete data sets are for southern China post-1470. Like all such preinstrumental records, however, these accounts are only of typhoons that made landfall. According to the official "county" (district) gazettes, only one typhoon a year on average struck coastal areas prior to 1900 compared to the average of four during the twentieth century, suggesting both the incompleteness of the available data and the possibility of major fluctuations in atmospheric circulation that periodically displaced storms southward (Liu et al. 2001, 416–61). Historical data for other countries regularly affected by typhoons in the western North Pacific have yet to be fully investigated, although archival records that promise a more comprehensive chronology do exist. From the late nineteenth century, a fuller picture of the frequency and impact of such storms emerges. On average, seven typhoons struck northern and central Vietnam each year, with the number rising from decade to decade. The inhabitants of coastal areas were sometimes exposed to repeated strikes by typhoons that followed in quick succession. In an eight-week orgy of destruction, for example, villagers in the Red River Delta experienced four successive typhoons between September and November 1897 (Kleinen 2007, 524–25, 528–29).

Much the same difficulties are faced when reconstructing the historical record of typhoons for Japan, Korea, and Taiwan. No instrumental record of typhoons exists for Japan or its subsequent colonial dependencies before the establishment of the Imperial Meteorological Observatory in 1875. Data for all three countries record the passage of between three and four typhoons per year since the mid-nineteenth century and an increase in cyclonic activity prior to 1900 and a decrease post-1950 (Grossman and Zaiki 2013, 112). Typhoons have caused serious loss of life and property in all three countries, accounting, for instance, for 65 percent of all damages in Korea caused by natural hazards since the Second World War and resulting in heavy agricultural losses from heavy rainfall in Taiwan (Wu and Kuo 1999; Kim and Choi 2007). Nor were the islands of the western North Pacific immune from the effects of tropical cyclones: Guam, the northern Marianas, Truk, Yap, and Ponape were periodically, if less frequently, hit. At least one typhoon a year passes over Guam, a medium-intensity cyclone occurs every six to ten years, and a really destructive one happens about every twenty years. One cyclone in 1855 threatened "to leave nothing left afoot over the surface of the entire island" (Ibáñez del Carmen et al. 1998, 8–10). Typhoons were proportionately even more devastating to the smaller Pacific islands. So destructive were the winds that struck the Caroline Islands in 1815 that they forced boatloads of refugees to make their way to Saipan and seek permission from the Spanish authorities to settle there.[2]

From the air, too, comes a further peril: wind is not so much the destroyer as is water. The intensity of typhoons may be categorized by wind velocity, but tropical cyclones and storms are also responsible for much of the precipitation over the western North Pacific. Spiral rain bands form an integral part of an approaching typhoon, and landfall often induces torrential downfalls and flooding. Sometimes, as in the case of Taiwan's Central Mountain Range, topography determines the intensity and location of rainfall (Wu and Kuo 1999, 73). Nor does the center of a tropical cyclone have to pass directly over a country to provoke heavy rainfall. So important are typhoons in this respect that cyclical fluctuations in their number may account for interdecadal variations in national rainfall levels (Kim and Choi 2007). Strong winds associated with tropical cyclones also cause water to pile up against shallow coastal areas, causing storm surges that scour the landscape for several miles inland. Reports of devastating floods associated with the passage of typhoons are reported in Chinese historical sources. The Reverend Rougé, a Christian missionary in the province of Kangsi, left an eyewitness account of how such floods caused destruction and death, noting how "in a few moments, the smallest water-causes became torrents, torrents became wide impetuous rivers, and rivers again swollen by the influx of so many streams, rose to a prodigious height, and burst forth over the country" (Dechevrens 1882, 46). Rainfall associated with typhoons continued to pose a considerable problem for coastal cities in the region well into the twentieth century. In Hong Kong heavy rainfall was responsible for causing 10,000 fatalities in 1906 and 11,000 in 1937, respectively equivalent to 5 percent and 1 percent of the total population (Ho 2003, 64, 74, 76).

Typhoons, however, do not only bear moisture-laden cloud bands but, as they make landfall, can also push the sea onto the land with devastating effect on coastal areas. The storm surge generated by Typhoon Kathleen in September 1947 drowned more than 2,300 residents living along the shores of Tokyo Bay (Longshore 1998, 209). Low-lying coastal communities are particularly at risk, and much of the coastal areas of central and northern Vietnam are highly susceptible to storm surges. Historically the Vietnamese

have responded to this threat by building extensive estuarine dikes to protect their communities against flooding. These dikes are also essential to protect agriculture and aquaculture from the intrusion of seawater but have to be continually maintained and repaired after every typhoon (Pilarczyk and Nguyen 2005, 114–17). Overall it is estimated that drowning causes 80 percent of all deaths due to tropical cyclones (Longshore 1998, 92).

Archival records on typhoons also exist for the Philippines, most notably the chronicle compiled by Miguel Selga, the Jesuit director of the Manila Observatory (1926–1946) who collated data on their occurrence between 1566 and 1934. The Spanish material is unusual in that many of the reports prior to the nineteenth century concern storms at sea and detail the vicissitudes of sailors caught in open waters. During the Napoleonic Wars, for instance, an entire Spanish fleet was wrecked by a typhoon on the night of 22 April 1797 (Selga 1936). Although certainly incomplete, Selga's chronology provides accurate information on the path of typhoons that match present-day variability and monthly distribution (García-Herrera et al. 2007, 10). The most commonly described track was for typhoons to form near Guam, move in an extended arc westward toward Luzon and from there split into two, one track curving further northward toward Japan and Korea and the other continuing on westward across the South China Sea (Ribera et al. 2005, 89). The northern part of Luzon and the Batanes islands were and continue to be the most exposed region of the archipelago. In fact, Selga's chronicle depicts an early colonial society beset by typhoons like the one of July 1717 that left "hardly a house . . . undestroyed however strong it was" or that of October 1897 that on a conservative estimate drowned 1,500 people on Samar and Leyte (Ribera et al. 2008, 196–97). Post-1950 data record an average of eight or nine typhoons a year making landfall in the Philippines and earning the archipelago the unenviable title of "most storm-exposed country on earth" (Brown 2013).

As regards flooding associated with the passing of typhoons, town chronicles held by the Manila Observatory Archive provide a record of the major floods between 1691 and 1900. The list gives details of the primary causes, geographical predisposition, and even the frequency of notable floods in specific localities. These accounts attribute 56 percent of all recorded floods directly to typhoons and often provide graphic accounts of their passage. One account, for instance, narrates how the "sudden rise" of the Abra River due to the passing of a typhoon in September 1867 caused "the angry waters" to destroy many roads and houses throughout the region and drowned a large number of domestic animals. Another account chronicles how, following the typhoon of October 1871, floods inflicted such enormous material losses in Central Luzon, the Ilocos provinces, and the Cagayan Valley that they were regarded as a national calamity.[3] Modern estimates credit tropical cyclones for 47 percent of the country's average annual rainfall (Rantucci 1994, 28). As a consequence, flooding in the Philippines has a seasonality to it that corresponds with the greater frequency of tropical cyclones between July and November.

Over the centuries, the very hazardousness of the air above the islands has encouraged Filipinos like other peoples of the western North Pacific to learn how to live with typhoons and adapt their cultures accordingly. How, for example, the people of the Batanes islands faced with the same hazards, have adapted their architecture to account for periodic severe wind speeds, as a consequence building squat, stone-walled structures or, as in Orchid Island, Taiwan, excavating depressions within which to situate their traditional houses (Hornedo 2000; Chen and Kuo 2010). Pierre Gourou (1975, 6–21) even talks about the "climatic unity" that binds the coastal zones of the western North Pacific together as a region: how the flow of warm, humid oceanic air from the south during the summer months provides the conditions that generate typhoons, and how their westward spiraling weaves a common path of destruction linking peoples and societies to each other. The growing awareness of a common risk as a chain of observatories, meteorological stations, and ocean-going ships logged their passage only served to further bind the people of the western North Pacific together despite their cultural and ethnic diversity. Nor was this connection only metaphorical but was increasingly a literal one, too, as regional telegraph networks and undersea cables linked the main centers of typhoon monitoring to one another, allowing the timely exchange of information (Cushman 2013). These Aeolian bonds only became more pronounced in the twentieth century as the scale of the subsequent destruction increased in proportion to the size of coastal populations. In this first consideration of the hazardousness of place, the air and its various destructive manifestations offer a radical alternative framework to the more state-centered master narrative of the Philippines by pursuing issues and questions that transcend the spatial and temporal boundaries of any one place or region. The commonality of risk places Filipinos within the western North Pacific and seeks to define a region by emphasizing the common issues that influence how environmental hazards affect people.

Land and the Hazardousness of Place

Typhoons and storm surges, however, are not the only ways by which the hazardousness of place helps redefine Filipino historiography. The archipelago also forms part of the Ring of Fire extending along the tectonic plates around the Pacific Ocean and lies off the northern fringes of the Alpine–Himalayan Orogenic Belt that stretches from the Atlantic to the Indian Ocean. The Ring of Fire is a 48,000– kilometer–long horseshoe rimming the Pacific Ocean from Indonesia to Chile where over 75 percent of all volcanoes in the world are located and where nearly 90 percent of the world's earthquakes happen as a result of the movement of lithospheric plates. The Alpine–Himalayan Orogenic Belt extends along the southern margins of Eurasia from Java to the Andaman Islands, through the Himalayas, Iran, and Turkey, and along the Mediterranean as far as the Atlantic. It includes the Alps, Carpathians, the mountains of Anatolia and Iran, the Hindu Kush, and the mountains of island Southeast Asia and is the planet's second most active seismic region accounting for between 5 and 6 percent of all earthquakes, including 17 percent of the strongest ones (Jackson and McKenzie 1984). Just as the hazardousness of place with regard to typhoons links the Philippines eastward and northward to a wider western North Pacific so do the threats posed by earthquakes and volcanoes tie the archipelago and its peoples westward to the Indian Ocean World.

The extent of destruction from earthquakes depends on several factors: its magnitude, that is, a measure of the amplitude or energy released during the event; its duration, with damage generally increasing over time; the local geology or the character of the underlying material; and the time of day the event takes place, with most fatalities occurring at night or in the early morning. Earthquakes are as frequent along the Alpine–Himalayan arc as they are along the Pacific Ring of Fire. In this way, Filipinos share a common risk with, for example, Iranians. Iran is located in an area of intense seismic activity and has repeatedly experienced highly destructive earthquakes of truly epic proportions, such as the Ardabil earthquake of 893 that caused as many as 150,000 deaths and the Khorasan earthquake of 1101 that left 60,000 dead. Many of the country's major cities like Tabriz have been periodically devastated by such events. The city was first reported destroyed in 858. The first well-documented earthquake dates from 1042 when 40,000–50,000 people died. The eighteenth century was particularly devastating for the city with major earthquakes in 1721 that perhaps claimed as many as a quarter of a million lives, one in 1727 that killed 77,000, another in 1755 when 40,000 died, and still another in 1780 when whole villages disappeared into fissures, killing a further 50,000–60,000 inhabitants. More recent earthquakes have been equally as costly, most notably the Gilan earthquake of 1990 near the Caspian Sea that left 50,000 people dead and 200,000 injured, or the Bam earthquake of 2003 that killed 43,000 people and flattened the city's ancient walled citadel (Gates and Ritchie 2007, 13, 23–24, 97, 136–37, 252).

Earthquakes have wracked the Indian subcontinent too, although the historical record is patchy before 1800 despite a written tradition that extends to at least 1500 BCE. Evidence of early earthquakes as described in the Mahabharata (circa 1500 BCE) or confirmed by archaeological excavations suggests serious earthquake damage to long-abandoned Harappan cities. There are numerous reports of major earthquakes occurring in northern India and Nepal prior to the twentieth century: in the Kathmandu Valley in 1668, in Bhutan and Assam in 1713, and east of Chittagong in 1762, which caused extensive flooding (Bilham 2004, 842–44; Alam and Dominey-Howes 2014, 903–33). Further costly earthquakes devastated the cities of Allah Bund (Gujarat) in 1819, Srinagar (Jammu and Kashmir) in 1885, and Kolkata (West Bengal) and Assam in 1897. The latter earthquake, estimated at Mw 8, caused the Brahmaputra River to reverse its flow, killing over 1,500 people and destroying many of the surrounding hill towns (Gates and Ritchie 2007, 18–19; Roy 2008, 275–76). The first major earthquake of the twentieth century occurred at Kangra (Himachal Pradesh) in April 1905, when an estimated 20,000 people died and over 100,000 buildings were destroyed (Gates and Ritchie 2007, 132). Major earthquakes also occurred in 1934 and 1935, respectively, at Bihar near the Nepali border and then at Quetta in modern-day Pakistan, where nine-tenths of the 40,000 population perished (ibid., 209; Roy 2008, 278–89). More recent earthquakes are characterized by mounting death tolls as the population densities of India, Pakistan, and Bangladesh continue to rise: the 2001 Bhuj earthquake killed nearly 20,000 people and left 600,000 homeless; and the 2005 Muzaffarabad earthquake killed 86,000, many of whom were children, and left 2.5 million people homeless (Gates and Ritchie 2007, 29, 171–72). In 2015 two earthquakes of over Mw 7 struck Nepal, razing many towns and villages to the ground, killing over 8,000 people and destroying priceless heritage sites in a disaster reminiscent of 1934 (Rana 2013). While there is no historical evidence to suggest that the number of major earthquakes worldwide has increased since 1701, there does appear to be periods when those greater than Mw 7.5 occurred more frequently. There are identifiable peaks in 1721–1730, 1751–1760, 1771–1780, 1911–1920, 1971–1980, and 2001–2010. Moreover, four out of the top ten earthquakes with the highest number of fatalities since 1701 have occurred since 2000 (Dunbar et al. 2010, 109–10).

All historical sources indicate a high annual level of earthquake activity throughout the Philippines, although the annual variation can fluctuate quite widely. Magnitude, too, varies enormously from mild vibrations to violent movements of the ground capable of wholesale destruction. Miguel Saderra Masó's study of the last two decades of the nineteenth century (1880–1897) reveals an average of 53.4 earthquake days a year or 4.5 per month. "No small number," he opines, considering that "the unit is the earthquake day and that it does not include the subsequent shocks" (Saderra Masó 1905, 253). Bailey Willis (1944, 79–81) documented 17 earthquakes described as having devastated whole districts between 1600 and 1900 and a further 36 that were capable of destroying buildings. A more scientific analysis that attempts to calibrate the preinstrumental strengths of such events estimates 17 earthquakes of Mw 7 or above prior to 1895 and a further 25 between 1911 and 1995 (Bautista and Oike 2000).

An eyewitness account of the earthquake that destroyed Manila on 30 November 1645 gives an impression of the terrifying powers of destruction unleashed by such events.

> The walls of stone were shaken and bent like pieces of paper or parchment blown by the wind; the towers shook and swayed like trees; and the thickest trees like the mast of a ship in the midst of the most violent of storms. One could hear nothing but the tangled sounds of ruination [*ruido de ruinas*] interspersed with the voices and screams of those seeking the mercy of Heaven. (Fayol 1649)

More than 450 people were killed or reported missing, 150 of the city's principal structures were totally destroyed, and most of the rest were left uninhabitable. Only *una sombre de Manila*, literally, a shadow of its former glory, remained of Spain's Pearl of the Orient, its once proud new capital in the Pacific.

Only with the establishment of the Manila Observatory in 1865 does the systematic collection of earthquake reports commence (Bautista and Bautista 2004). The records suggest that some parts of the archipelago are more prone to earthquakes than others. Earthquakes are more frequent in the northern part of the country than in the southern half, although this pattern may be simply because there were fewer churches and less population centers in the south than in the north (Saderra Masó 1905, 252; Repetti 1946). The clergy constituted the most ardent observers of seismic (and for that matter cyclonic) events even into the instrumental era (Warren 2009). Particularly noticeable is the absence of earthquake data for the east coast along the Philippine Trench, which remains sparsely inhabited even today (Bautista and Oike 2000, 161). Although much of the preinstrumental historical records are too unreliable to draw firmer conclusions, there appear to be cycles of seismic activity, such as between 1851 and 1900, followed by quieter periods. The historical evidence is clear enough, however, to conclude that virtually anywhere in the Philippines was and is potentially a very hazardous place to live in. Only possibly the island of Palawan is safer than other places in the country, with no record of a high magnitude earthquake according to the seismic map produced by the Philippine Institute of Volcanology and Seismology (PHIVOLCS). Otherwise destructive earthquakes have shaken all major regions of the archipelago: in the south between Sulu and Basilan in 1897, at Mw 8.6 possibly the strongest earthquake ever recorded in the archipelago; again in 1918 (Celebes Sea), in 1924 and 1943 (Davao Oriental), and in 1976 (Sultan Kudarat); in the Visayas in 1897 (Samar and Masbate), in Aklan in 1948, and most recently in 2013, when tragically so many of Bohol's fine historical churches were laid to ruin; in northern and central Luzon in 1627 (Cagayan), in 1901 (Quezon), in 1934 (Ilocos Sur), in 1968 (Casiguran), and in 1990 (Baguio); and of course in Manila, most notably in 1645, 1658, 1863, and 1880 (Saderra Masó 1905; Repetti 1946; Bautista and Oike 2000).

Earthquakes, however, are not the sole terrestrial hazard. Along the Pacific Ring of Fire and the eastern edges of the Alpine–Himalayan Orogenic Belt, particularly in the Andaman Sea and the Indonesian archipelago, volcanoes also pose an infrequent but deadly threat to people. Indonesia has more than 200 active volcanoes and was the site of the 1883 eruption of Krakatoa, one of the most violent volcanic events in recent history. Reputedly the noise of the eruption was heard 4,800 kilometers away on the island of Rodrigues, where it was mistaken for the sound of ships' guns over the horizon (Winchester 2004). Although mainly inflicting devastation on a more localized level, the effects of volcanic eruptions can have much wider geographical consequences. The eruption of Samalas volcano adjacent to Mount Rinjani on Lombok circa 1257 adversely affected climate and harvests around the world and ranks among the largest Holocene explosive events (Lavigne et al. 2013). Similarly, the eruption of Mount Tambora on the island of Sumbawa in 1815, one of the most powerful in recorded history at VEI (Volcanic Explosivity Index) 7, cast an estimated 150 cubic kilometers of solid material in the form of fine ash into the atmosphere that changed climate and weather patterns in the northern hemisphere during the following year, the so-called year without a summer. Locally 80,000 people died as a result of starvation and disease (Gates and Ritchie 2007, 252–53). Among the many calderas formed by past eruptions throughout the archipelago is Mount Toba on the island of Sumatra formed some 74,000 years ago as a result of an apocalyptic VEI 8 eruption. Many of Indonesia's volcanoes are still very active such as Mount Merapi, the Mountain of Fire, whose eruption in 1006 is credited with the demise of the central Javanese kingdom of Mataram. Merapi has erupted on more than sixty-eight occasions since 1548 (Soegiharto 2006).

Volcanoes are also a feature of the Philippine landscape, shaping not only the lives of local people but also the geomorphology of the land itself. Over twenty volcanoes have erupted in historical times, causing enormous loss to life and property. Two of the most active are Mount Mayon in Albay province and Taal volcano, situated in a caldera lake just south of Manila. Together the two have erupted over eighty times since 1572. On occasion, too, volcanic eruptions have impacted dramatically upon the history of the islands. The eruption of the Macaturin volcano circa 1765 is credited with turning the Iranun in the course of a century from sedentary agriculturalists in the Rio Grande valley of southwestern Mindanao into the feared maritime raiders whose proas roamed the shorelines of the Celebes Sea (Warren 2012). Currently, there are twelve active volcanoes in the archipelago, including Mount Pinatubo, which before its cataclysmic eruption in 1991 had lain dormant for the past 400 years. The sheer extent of the desolation and destruction caused by this eruption persuaded the US to finally abandon Clark Air Force Base, its largest overseas airbase and one of its most strategically important military outposts in East Asia during the Cold War (Kahin 1993, 136; Rantucci 1994, 102–5).

Volcanic eruptions regularly punctuate the recorded history of the archipelago: there were nine between 1565 and 1700, nine also in the eighteenth century, and sixty-seven in the nineteenth century. The large number of eruptions between 1801 and 1900 is indicative of the greater reliability of the data and may also reflect the cyclical nature of volcanic activity. Many of the archipelago's active volcanoes either appeared or "woke up" during this period: Bulusan in southern Luzon has erupted seventeen times since becoming active in 1852; Kanlaon on Negros Island has erupted twenty-six times since 1866; and Hibok-Hibok off the north coast of Mindanao has erupted nineteen times since 1827, most notably in cycles between 1871–1875 and 1948–1953 (Saderra Masó 1905, 187; Rantucci 1994, 26). In the Philippines as a whole there have been a further twenty-five volcanic eruptions since 1900 causing 2,996 deaths and affecting 1,734,907 people (CRED 2009). Luzon, with a current population density of over 440 people per square kilometer, experiences more volcanic eruptions than any other part of the archipelago. According to Saderra Masó (1905, 187), 89 percent of all recorded volcanic eruptions prior to 1905 took place on Luzon, and three of the archipelago's five most active volcanoes (Mayon, Taal, and Bulusan) are located there. Volcanoes, no less than earthquakes, have also proven to be a significant historical threat shaping the hazardousness of place and the daily lives of most Filipinos.

Filipinos like many other people living along tectonic fault lines have had to adapt aspects of their societies to accommodate these terrestrial hazards. The recurrent nature of earthquakes, in particular, has led to the emergence of what some scholars have called "seismic cultures." Seismic cultures can be defined as societies having "the knowledge (both pragmatic and theoretical) that has built up in a community exposed to seismic risks through time" (Homan and Eastward 2001, 624). The key to the emergence of a seismic culture has been the development of construction techniques that have proven effective in minimizing loss of life and mitigating damage to buildings during earthquakes. Seismic cultures, for instance, have emerged all along the Alpine–Himalayan Orogenic Belt from west to east. Architectural styles based on a variant of compartmentalized, timber-framed, infilled masonry building techniques are to be found in Portugal (*pombalino*), Italy (the *casa baraccata*), Turkey (*hatillar*), and Kashmir (*dhajji dewari*).

This mode of construction lends structures greater resilience in the event of earthquakes and shares similar principles with the traditional colonial house in the Philippines, the *bahay na bato* (Bankoff 2015).

Sea and the Hazardousness of Place

As an archipelagic nation, the Philippines is surrounded by sea. Across the vast expanses of the Pacific come the typhoons that periodically force saltwater onto the land with deadly force. But the same continuous series of oceanic trenches, volcanic arcs, and orogenic belts are also responsible for yet another hazardousness of place, which Filipinos share with other similarly threatened cultures and societies. Unlike storm surges, large undersea earthquakes, landslides, or volcanic eruptions mainly at tectonic plate boundaries cause tsunamis, which send surges of water (a wave train) far inland and produce widespread destruction along coastal areas. Approximately 80 percent of all tsunamis happen within the Pacific Ocean's Ring of Fire. The great Chilean earthquake of 1960 and the Good Friday earthquake in Alaska of 1964 both produced killer tsunamis. In fact the 1960 earthquake in Chile generated a tsunami that raced across the Pacific, reportedly killing 60 people in Hawai'i and 438 people in Japan and the Philippines (Gates and Ritchie 2007, 48).

A less well-documented tsunamigenic subduction zone also runs the entire breadth of the Indian Ocean from the Makran coast in Iran along Pakistan, India, Bangladesh, and the Andaman-Nicobar Islands to Sumatra and Java. New research on palaeo-tsunamis shows that events here are rare, occurring on a basin-wide scale perhaps only three times in the last 200 years: in 1833, 1883, and most notoriously in 2004 (Kumar and Achyuthan 2006). The latter was generated by a massive Mw 9.3 earthquake that generated waves up to 27 meters in height along the Sumatran coast that penetrated over a kilometer inland. Two hours later, 12-meter-high waves hit Sri Lanka and India, devastating ocean states like the Maldives and penetrating as far as Somalia on the East African coast. Nearly 300,000 people in thirteen countries died, making it one of the deadliest tsunamis ever recorded (Gates and Ritchie 2007, 24–25). More localized tsunamis affect the Bay of Bengal and the Arabian Sea (Rastogi 2007, 3–4; Kumar 2009, 482–83).

Since 1603 the Philippines has been struck by at least twenty-nine tsunamis, although the number of events is certainly greater than this figure and many have remained undocumented. The eastern seaboard and southern Mindanao are the most vulnerable areas of the archipelago and also some of the wildest and least populated regions that were only nominally under the state's purview until quite recently (Punongbayan 1994, 8). A powerful tsunami, the result of a severe earthquake that rocked the southern Philippines on 21 September 1897, is described as having struck several locations in Mindanao, the Sulu archipelago, and the southern Visayan islands. Two hills on either side of the river collapsed, and many dwellings were swept away in Zamboanga; the market place was carried off in Isabela de Basilan; and the island of Tubigan in Sulu was divided in two (Saderra Masó 1905, 217–19). Altogether, prior to 1970, nine tsunamis were recorded for Mindanao, eight for the Visayas, seven for northern Luzon, and only five for central and southern Luzon.[4] The most destructive tsunami recorded in the Philippines struck the south coast of Mindanao on 16 August 1976. A Mw 8.1 earthquake in the Cotabato Trench generated 5-meter-high waves that devastated communities along the Moro Gulf, causing at least 4,000 fatalities. Local residents were seemingly unaware of the need to move to higher ground, and most people were sucked out to sea (Løvholt et al. 2012).

The sea, too, generates its own particular form of hazardousness that is specific to certain coastal places. Some settlements, in fact, simply become too hazardous to live in, leading communities to abandon the site and relocate to a safer area, usually inland. In the Philippines, for instance, the coastline of the present-day province of Aurora remains a remote and sparsely inhabited area despite its close proximity to Manila. Its principal town, Baler, had to be relocated 5 kilometers inland because of a devastating tsunami on 27 December 1735. The parish priest left an eyewitness account of the tragedy, which drowned a large number of the inhabitants.

> I was awakened by the Sacristan who informed me that the convent was moving, I rushed to the window to find out, and was shaken by what I witnessed. The convent was being carried by the rushing sea. When the tide receded, there was no sign of civilization that remained except the barren ground littered with scattered dead bodies and houses sheared clean by the onrushing waves with the exception of a few settlement further inland. (Huerta 1855, 280)

Similar adaptations have been noted in other societies. In perhaps the most extreme example, a series of tidal waves in the fifteenth century, known as *taniwha* in Maori legend, is credited with sweeping societal changes that

included the abandonment of low-lying settlements and the emergence of a warrior culture based on the construction of fortified hill forts (*pā*) (Goff and McFagden 2001).

Part of a Wider World

As this brief catalog of typhoons, storm surges, earthquakes, volcanoes, and tsunamis graphically shows, danger is never far away from many different communities who live in the western North Pacific, besides the Alpine–Himalayan Orogenic Belt, or along the Pacific Arc of Fire. Filipinos are linked through a common hazardousness of place to many other cultures and societies of a wider world that also have to meet the exigencies and challenges of living with threat on a daily basis. An environmental transnational approach to the Filipino past that begins with shared risks and fully considers meteorological and geophysical hazards offers a wider perspective and a new lens for understanding patterns of historical development.

On a national level, it calls for an assessment of human–environmental interactions over time in terms of: (a) changing migration and settlement patterns—why, when, and where people lived; (b) agriculture and land-use—what was grown and to what ends; (c) housing and architecture—structures engineered for earthquakes and floods; and (d) even slavery and war as a result of environmental stress. On an international level, it invites comparisons of how different cultures prepared for, managed, and recovered from the impact of similar hazards over time, offering an alternative to colonial-inspired and geopolitical periodization and frameworks. For instance, in how they have historically adapted to frequent earthquakes, Filipinos can be compared with, say, Japanese, Nepalis, Iranians, or Italians with whom they share a common past experience as well as an ongoing future threat. There is the opportunity to make meaningful comparisons of best practices in the past to apply to present and future dangers, and to reassess historical cultural attainment in terms of environmental adaptation rather than naked power plays.

What is the place for the local, however, in such an environmental transnational history? Is there still a place for "the national" and for national disaster cultures in this bigger history? While no single factor suffices to explain why location and circumstances are so conducive to the formation of social capital in the Philippines, the important role hazard has played in the daily life of Filipinos encourages forms of mutual dependence and cooperation. A long history of formal and informal networks committed to individual and community welfare throughout the archipelago has made people more resilient to better cope with the magnitude and frequency of hazard. Evidence of community associations can be dated back to the religious fraternities, reciprocal labor arrangements, unions, clubs, and PTAs that emerged prior to the twentieth century, and that currently find expression in the proliferation of civil society organizations in the present (Bankoff 2007). The origins of this social capital have been variously explained in terms of the mutual dependence required to live in such a hazardous place: in the Philippines, trust reposes in the family and the extended community often cast in terms of fictive kinship rather than in the institutions and capacities of the state.

The frequency and magnitude of the hazards that Filipinos confront on an almost daily basis promote a more abstract sense of community welfare and encourage forms of community support and reciprocity (Bankoff 2012). The Philippines, for example, has the largest number of NGOs per capita in Asia (Wurfel 2004). There is even a word for this sense of community in Tagalog: *bayanihan* (from the root *bayan* or people). Rather than the "damaged culture" so infamously depicted by James Fallows (1987), the everyday hardships posed by living in the Philippines suggest an intriguing relationship between risk and the number and vigor of civic engagement that Filipinos share with diverse societies and cultures. The hazardousness of place not only informs the Filipino past but also links the peoples of the archipelago through the shared experience of disasters to a wider region that calls for new comparative histories.

Notes

This article is a revised version of a paper originally presented at the conference "Disasters in History: The Philippines in Comparative Perspective," Ateneo de Manila University, Quezon City, organized by this journal, the Ateneo de Manila University's Department of History, and Kyoto University's Center for Southeast Asian Studies, Quezon City, 24–25 Oct. 2014.

1 There are few general histories of the Philippines and none that improve upon Cushner 1971 and Corpuz 1989. On the difference between highland and lowland, see Scott 1982.

2 Sobre la periodicidad de los baguios de Guam. Box–10, 41. Archives of the Manila Observatory, Quezon City.

3 List of typhoons 1844–1935. Box–9, 35. Archives of the Manila Observatory, Quezon City.

4 Giovanni Rantucci (1994, 24–25) states that there were only twenty-seven tsunamis in the text while providing a map from PHIVOLCS that clearly records thirty, including that of 1976.

References

Alam, Edris and Dale Dominey-Howes. 2014. An analysis of the AD1762 earthquake and tsunami in SE Bangladesh. *Natural Hazards* 70:903–33.

Bankoff, Greg. 2003. *Cultures of disaster: Society and natural hazard in the Philippines*. London: RoutledgeCurzon.

———. 2007. The dangers of going it alone: Social capital and the origins of community resilience in the Philippines. *Continuity and Change* 22(2): 327–55.

———. 2012. Storm over San Isidro: Civic community and disaster risk reduction in the nineteenth century Philippines. *Journal of Historical Sociology* 25(3): 331–51.

———. 2015. Design by disasters: Seismic architecture and cultural adaptation to earthquakes. In *Cultures and disasters: Understanding cultural framings in disaster risk reduction*, ed. Fred Krüger, Greg Bankoff, Terry Cannon, Benedikt Orlowski, and E. Lisa F. Schipper, 53–71. London: Routledge.

Bautista, Maria Leonila P. and Bartolome C. Bautista. 2004. The Philippine historical earthquake catalogue: Its development, current state and future directions. *Annals of Geophysics* 47(2–3): 379–85.

Bautista, Maria Leonila P. and Kazuo Oike. 2000. Estimation of the magnitudes and epicenters of Philippine historical earthquakes. *Tectonophysics* 317(1–2): 137–69.

Bilham, Roger. 2004. Earthquakes in India and the Himalaya: Tectonics, geodesy and history. *Annals of Geophysics* 47(2–3): 839–58.

Birkmann, Joern, Matthias Garschagen, Peter Mucke, Almuth Schauder, Thomas Seibert, Torsten Welle, Jakob Rhyner, Stefan Kohler, Thomas Loster, Dirk Reinhard, and Ira Matuschke. 2014. *World risk report*. Berlin: Bündnis Entwicklung Hilft and United Nations University–Institute for Environment and Human Security.

Brown, Sophie. 2013. The Philippines is the most storm-exposed country on earth. *Time*, 11 Nov. Online, http://world.time.com/2013/11/11/the-philippines-is-the-most-storm-exposed-country-on-earth/, accessed 3 Dec. 2014.

Burton, Ian, Robert W. Kates, and Gilbert F. White. 1978. *The environment as hazard*. New York: Oxford University Press.

Centre for Research on the Epidemiology of Disasters (CRED). 2009. Country profile: Philippines. In *EM-DAT: The international disaster database*. Brussels: Université Catholique de Louvain. Online, http://www.emdat.be/country_profile/index.html, accessed 1 June 2015.

Chen, Chi-Jen and Szu-Tung Kuo. 2010. The influencing factors of architectural composition and the arrangement of human settlement in Orchid Island. In *Design & Nature V: Comparing design in nature with science and engineering*, ed. C. A. Brebbia and A. Carpi, 89–100. Southampton: WIT Press.

Corpuz, Onofre D. 1989. *The roots of the Filipino nation*, 2 vols. Quezon City: Aklahi Foundation.

Cushman, Gregory T. 2013. The imperial politics of hurricane prediction: From Calcutta and Havana to Manila and Galveston, 1939–1900. In *Nation-states and the global environment: New approaches to international environmental history*, ed. Erika Marie Bsumek, David Kinkela, and Mark Atwood Lawrence, 137–62. New York: Oxford University Press.

Cushner, Nicholas P. 1971. *Spain in the Philippines: From conquest to revolution*. Quezon City: Ateneo de Manila University Press.

Cutter, L. Susan, Lindsey Barnes, Melissa Berry, Christopher Burton, Elijah Evans, Eric Tate, and Jennifer Webb. 2008. A place-based model for understanding community resilience to natural disasters. *Global Environmental Change* 18:598–606.

Dechevrens, Marc. 1882. *The typhoons of the Chinese seas in the year 1881*. Shanghai: Kelly and Walsh.

Dunbar, Paula, Kelly Stroker, and Heather McCullough. 2010. Do the 2010 Haiti and Chile earthquakes and tsunamis indicate increasing trends? *Geomatics*, *Natural Hazards and Risk* 1(2): 95–114.

Elsner, James Brian and Kam-biu Liu. 2003. Examining the ENSO-typhoon hypothesis. *Climate Research* 25:43–54.

Fallows, James. 1987. A damaged culture. *The Atlantic Monthly*, Nov.: 49–58.

Fayol, José O. 1649. *Epítome y relación de varios sucesos de mar y tierra en las Islas Filipinas. Temblor y ruina, año 1645. Peleas y victorias navales, año 1646–47*. Madrid: n.p.

García-Herrera, Ricardo, Pedro Ribera, Emiliano Hernández, and Luis Gimeno. 2007. North-west Pacific typhoons documented by the Philippine Jesuits, 1566–1900. *Journal of Geophysical Research* 112:1–12.

Gates, Alexander E. and David Ritchie. 2007. *Encyclopaedia of earthquakes and volcanoes*. 3d ed. New York: Checkmark Books.

Goff, James R. and Bruce G. McFadgen. 2001. Catastrophic seismic-related events and their impact on prehistoric human occupation in coastal New Zealand. *Antiquity* 74:155–62.

Gourou, Pierre. 1975. *Man and land in the Far East*. New York: Longman.

Grossman, Michael J. and Masumi Zaiki. 2013. Documenting 19th-century typhoon landfalls in Japan. *Review of Asian and Pacific Studies* 38:95–118.

Hewitt, Kenneth. 1980. Review of "The environment as hazard." *Annals of the Association of American Geographers* 70(2): 306–11.

Hewitt, Kenneth and Ian Burton. 1971. *The hazardousness of a place: A regional ecology of damaging events*. Toronto: University of Toronto Press.

Ho Pui-yin. 2003. *Weathering the storm: Hong Kong Observatory and social development*. Hong Kong: Hong Kong University Press.

Homan, Jacqueline and Warren J. Eastward. 2001. 17 August 1999 Kocaeli (Izmit) earthquake: Historical records and seismic culture. *Earthquake Spectra* 17(4): 617–34.

Hornedo, Florentino H. 2000. *Taming the wind: Ethno-cultural history on the Ivatan of the Batanes isles*. Manila: University of Santo Tomas Publishing House.

Huerta, Felix de. 1855. *Estado geográfico, topográfico, estadístico, histórico, religioso de la Santa y Apostólico Provincia de San Gregorio Magno "Baler, Distrito del Príncipe."* Manila: M. Sanchez y Cª.

Ibáñez del Carmen, Aniceto and Francisco Resano del Corazón de Jesús. 1998. *Chronicle of the Marian Islands (Crónica de las Islas Marianas)*, trans. and annot. Marjorie Driver. Mangilao: Micronesian Area Research Center, University of Guam.

Jackson, James and Dan McKenzie. 1984. Active tectonics of the Alpine–Himalayan belt between western Turkey and Pakistan. *Geophysical Journal of the Royal Astronomical Society* 77:185–264.

Japan Meteorological Agency. 2014. Climatology of tropical cyclones. Online, http://www.jma.go.jp/jma/jma-eng/jma-center/rsmc-hp-pub-eg/climatology.html, accessed 6 May 2014.

Kahin, George McT. 1993. The US–Philippine security relationship: Dependent on the bases? *South East Asia Research* 1(2): 127–42.

Kim, Baek-Jo and Ki-Seon Choi. 2007. Climatological characteristics of tropical cyclones making landfall over the Korean peninsula. *Journal of the Korean Meteorological Society* 43(2): 97–109.

Kleinen, John. 2007. Historical perspective on typhoons and tropical storms in the natural and socio-economic system of Nam Dinh (Vietnam). *Journal of Asian Earth Sciences* 29:523–31.

Kumar, Arun. 2009. Reclaimed islands and new offshore townships in the Arabian Gulf: Potential natural hazards. *Current Science* 96(4): 480–85.

Kumar, K. A. and H. Achyuthan. 2006. A record of palaeo-tsunami in the Indian Ocean. *Marine Geodesy* 29:253–63.

Lavigne, Frank, Jean-Philippe Degeai, Jean-Christophe Komorowski, Sébastien Guillet, Vincent Robert, Pierre Lahitte, Clive Oppenheimer, Markus Stoffeld, Céline M. Vidal, Suronoh, Indyo Pratomo, Patrick Wassmera, Irka Hajdas, Danang Sri Hadmoko, and Edouard de Belizala. 2013. Source of the great A.D. 1257 mystery eruption unveiled, Samalas volcano, Rinjani Volcanic Complex, Indonesia. *Proceedings of the National Academy of Sciences* 110(42): 16742–47.

Liu, Kam-biu, Caiming Shen, and Kin-sheun Louie. 2001. A 1000-year history of typhoon landfalls in Guangdong, Southern China, reconstructed from Chinese historical documentary records. *Annals of the Association of American Geographers* 91(3): 453–64.

Longshore, David. 1998. *Encyclopaedia of hurricanes, typhoons, and cyclones*. New York: Facts on File.

Løvholt, Finn, Daniela Kühn, Hilmar Bungum, Carl B. Harbitz, and Sylfest Glimsdal. 2012. Historical tsunamis and present tsunami hazard in eastern Indonesia and the southern Philippines. *Journal of Geophysical Research* 117(B9): 1–19. Online, http://onlinelibrary.wiley.com/doi/10.1029/2012JB009425/pdf, accessed 10 July 2014.

Pilarczyk, Krystian and Nguyen Si Nuoi. 2005. Experience and practices on flood control in Vietnam. *Water International* 30(1): 114–22.

Punongbayan, Raymundo. 1994. Natural hazards in the Philippines. In *Proceedings of national conference on natural disaster mitigation, 19–21 October 1994*, 1–10. Quezon City: Philippine Institute of Volcanology and Seismology, Department of Science and Technology.

Rana, Brahma Shumsher Jung Bahadur. 2013. *The great earthquake in Nepal 1934 A.D.* Kathmandu: Ratna Pustak Bhandar.

Rantucci, Giovanni. 1994. *Geological disasters in the Philippines: The July 1990 earthquake and the June 1991 eruption of Mount Pinatubo*. Rome: Dipartimento per l'informazione e l'editoria.

Rastogi, B. K. 2007. A historical account of the earthquakes and tsunamis in the Indian Ocean. In *The Indian Ocean tsunami*, ed. Tad S. Murty, U. Aswathanarayana, and N. Nirupama, 3–18. London: Taylor and Francis.

Repetti, William. 1946. Catalogue of Philippine earthquakes, 1589–1899. *Bulletin of the Seismological Society of America* 36(3): 133–322.

Ribera, Pedro, Ricardo García-Herrera, and Luis Gimeno. 2008. Historical deadly typhoons in the Philippines. *Weather* 63(7): 194–99.

Ribera, Pedro, Ricardo García-Herrera, Luis Gimeno, and Emiliano Hernández. 2005. Typhoons in the Philippine Islands, 1901–1934. *Climate Research* 29:85–90.

Roy, Tirthankar. 2008. State, society and market in the aftermath of natural disasters in colonial India: A preliminary exploration. *Indian Economic and Social History Review* 45:261–94.

Saderra Masó, Miguel. 1905. Volcanoes and seismic centers. In *Census of the Philippine Islands taken under the direction of the Philippine Commission in the year 1903*, vol. 1, 184–254. Washington, DC: Government Printing Office.

Scott, William Henry. 1982. *The discovery of the Igorots: Spanish contacts with the pagans of northern Luzon*. Quezon City: New Day.

Selga, Miguel. 1935. *Charts of remarkable typhoons in the Philippines 1902–1934; catalogue of typhoons 1348–1934*. Manila: Bureau of Printing.

Soegiharto, Handewi. 2006. Merapi and the demise of the Mataram Kingdom. *Jakarta Post*, 13 June. Online, http://www.thejakartapost.com/news/2006/06/13/merapi-and-demise-mataram-kingdom.htm, accessed 8 July 2014.

Terry, James P., Nigel Winspear, and Tran Quoc Cuong. 2012. The 'Terrific Tongking Typhoon' of October 1881—Implications for the Red River Delta (northern Vietnam) in modern times. *Weather* 67(3): 72–75.

Warren, James F. 2009. Scientific superman: Father José Algué, Jesuit meteorology, and the Philippines under American Rule, 1897–1924. In *Colonial crucible: Empire in the making of the modern American state*, ed. Alfred W. McCoy and Francisco A. Scarano, 508–22. Madison: University of Wisconsin Press.

———. 2012. Volcanoes, refugees and raiders: The 1765 Macaturin eruption and the rise of the Iranun. Paper presented at the conference "Dimensions of the Indian Ocean World Past: Sources and Opportunities for Interdisciplinary Work in Indian Ocean World History," organized by the Asia Research Centre, Australia Research Council Linkage Grant, Murdoch University, and the Indian Ocean World Centre, Major Collaborative Research Initiative, McGill University held at the Western Australian Maritime Museum, Fremantle, 12–14 Nov.

Willis, Bailey. 1944. Philippine earthquakes and structure. *Bulletin of the Seismological Society of America* 34(2): 69–81.

Winchester, Simon. 2004. *Krakatoa: The day the world exploded: August 27, 1883*. London: Penguin Books.

Wu, Chun-Chieh and Ying-Hwa Kuo. 1999. Typhoons affecting Taiwan: Current understanding and future challenges. *Bulletin of the American Meteorological Society* 80(1): 67–80.

Wurfel, David. 2004. Civil society and democratization in the Philippines. In *Growth and governance in Asia*, ed. Yoichiro Sato, 214–23. Honolulu: Asia-Pacific Center for Security Studies.

Greg Bankoff is professor of modern history, University of Hull, Cottingham Rd, Hull, East Riding of Yorkshire HU6 7RX, United Kingdom. Over the last twenty years, he has worked and published extensively on both the historical dimension of how societies adapt to risk as well as engaged with contemporary civil defense and emergency management practices in Asia, Australasia, and more recently in Europe. His most recent publications include coauthoring The Red Cross's *World Disaster Report 2014: Culture and Risk* and a companion coedited volume entitled *Cultures and Disasters: Understanding Cultural Framings in Disaster Risk Reduction* (2015). He is also the author of *Cultures of Disaster: Society and Natural Hazard in the Philippines* (2003). <g.bankoff@hull.ac.uk>