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Storms of history

Water, hazard and society in the Philippines

1565-1930

The Philippine Archipelago is both geo-physically and meteorologically one of the world's natural hazard 'hot spots'; it experiences more such events than any other country.¹ Modern databases, however, are usually limited by their inability to provide a more extensive historical overview of the incidence and experience of hazard as their documentation rarely extends further than the nineteenth century. Without a fuller historical appreciation of these phenomena, there is always the risk that the disasters caused by natural hazards may be viewed as of recent provenance, simply the product of larger populations, a greater concentration of infrastructure, and, perhaps, accelerated environmental degradation. While few would deny the importance of these factors in contributing to the increasing impact of disasters on modern societies, the emphasis on the present or the recent past tends to disguise the fact that many societies long have had exposure to such events. Moreover, these events may be factors of considerable importance in understanding the historical development of the peoples inhabiting these areas.

Above all, the Philippines is part of a region dominated by water: the degree of marine influence over its climate, environment, settlement, communications and development of resources considered unmatched in any other part of the world (Barrow 1990:78). Hazards associated with near-shore waters such as tropical cyclones, storm surges and tsunamis have posed a constant threat to shipping and repeatedly endangered coastal settlements. The relationship, too,

¹ According to the Belgium based Centre for Research on the Epidemiology of Disasters, which has compiled one of the most comprehensive record on the occurrence of natural hazards in the world since 1900, the Philippines has experienced the most events defined as requiring international assistance, or causing ten deaths or affecting more than a hundred persons. Between 1900 and 1991, there were 702 disasters – earthquakes, volcanic eruptions, typhoons, floods, droughts, landslides and the like – an average of eight a year, causing 51,757 fatalities (Bengco 1993:2). In terms of fatalities over the same period, the countries with the five highest death tolls from natural disasters were China 13,284,633; the former USSR 8,874,719; India 8,576,064; Bangladesh 3,164,642; and Nigeria 1,016,519 (RP Tops 1993:1, 11). For full data on the twentieth century, see EM-DAT n.d.

between typhoons, rainfall levels and recurrent climatic cycles associated with the El Niño Southern Oscillation (ENSO) weather pattern have also ensured that this influence extends well beyond the shoreline. All the peoples who live in these islands have been affected by these same phenomena either through flood and drought or by the waves of volcanic debris known as *lahar* that have engulfed entire communities. Given the frequency and magnitude of these hazards in the Philippines, this paper argues that a systematic documentation of such events beginning with the Spanish conquest in the sixteenth century is such as to warrant an investigation of the ways in which disasters may have actually affected the evolution and adaptation of societies in the archipelago (Bankoff 2003). Even within the islands, the evidence suggests that some areas, and therefore some peoples, have been more vulnerable to hazards than others. First an appreciation of the general nature of hazard and the physical environment is explored before the history of those disasters most associated with its maritime geography up until the 1930s is reconstructed from archival sources. In particular, an attempt is made to estimate the effect of these hazards in terms of numbers of people affected, damage to property and loss of life. Though incomplete and patchy at times, the data still clearly show the magnitude of such phenomena on colonial society in the archipelago.

Environment and hazard

An archipelago located off Indo-China in the Western Pacific, the land area of the Philippines consists of 7,107 islands that total little more than 300,000 square kilometres but comprises over seventeen thousand kilometres of coastline. It lies on what has been called the 'Pacific Rim of Fire' between two deep-sea trenches, the Philippine Trench to the east and the Manila Trench to the west, and is bounded in the south and southwest by the Cotabato, Davao, Sulu and Negros Trenches respectively. Wedged between the much larger Pacific and Eurasian tectonic plates, the small Philippine Sea one is an area of extreme seismic activity. There are numerous earthquakes and volcanic eruptions caused by movements and displacements along the major Philippine Fault Zone and by the head-on collision and subduction of the neighbouring continental and oceanic plates (Punongbayan 1994:5).

In the quarter century alone between 1950 and 1975, the islands experienced 2,126 recorded earthquakes (Torrado 1978:7-8) and are shaken on average five times a day by such events, though most are too faint to be felt (Almario 1992:15-9). There are also 220 volcanoes, 21-22 of which are classified as active since their eruptions have been historically documented.²

² Punongbayan 1994:5; Rantucci 1994:25. As the historical record does not extend much beyond four hundred years, there will undoubtedly be a reclassification of some volcanoes from inactive to active (Martinez 1994:107).

The three most active volcanoes, Mayon (Albay), Taal (Manila) and Canlaon (Negros) have erupted 98 times between 1572 and 1993 and there have been no less than 41 such eruptions described as destructive over the same period, an average of one major event every decade (Rantucci 1994:25-6). Both the volcanic chain and earthquake belt closely parallel the distribution of the various deep-sea trenches bounding the islands. Thus the volcanoes in the Sulu Archipelago constitute a northeast-southwest chain that parallels the direction of the Sulu Trench, while those in the Bicol Peninsula are aligned with the north-northwest direction of the Philippine Trench. Proximity to these deep-sea trenches also appears to have some bearing on the depth of earthquakes with those having epicentres closer to them being less deep than those with ones further away (Punongbayan 1994:5).

Closely associated with both submarine earthquakes and volcanic eruptions are the tsunamis that have periodically ravaged the coastline. Since 1603, at least 27 of these giant sea waves with crests sometimes exceeding 25 metres have been recorded hitting the coastline of the Philippines with areas in southern Mindanao facing the Celebes Sea being the most vulnerable to such hazards (Rantucci 1994:24; Punongbayan 1994:8). Aside from this seismic activity, the Philippines is also prone to climate-related hazards especially in the form of powerful typhoons that sweep across the islands from the Southwest Pacific, mainly in the period from June to November. On average, the islands are hit by over 20 typhoons each year, some with wind speeds in excess of 200 kilometres an hour, that recurrently devastate low-lying areas of the eastern seaboard (Rantucci 1994:27).

The principal hazard associated with volcanic eruptions apart from the accompanying lava flows or tephra clouds³ is the danger posed by *lahar*, pyroclastic material composed of boulders, pebbles, sand, dust and gas in the form of a dense mud-like substance. Often heated to temperatures of a 1000°C, such mudflows create a layer of expanding air in their advance that enables them to sweep along the ground at great speeds, sometimes in excess of 500 kilometres per hour. Objects in their path are either destroyed by direct impact or buried, while the encounter proves mainly near fatal for all living things. Cold or secondary concentrations of *lahar* accumulate on the slopes of volcanoes only to be regularly set in downward motion by the subsequent heavy rains associated especially with the typhoon season. Metre-high waves of this material flow onto the lowlands and cover surrounding areas to distances of 40 kilometres (Punongbayan 1994:8-9; Rantucci 1994:26, 110). Typhoons, which are responsible for 47 per cent of average annual rainfall in the archipelago,

³ Lava flows are relatively large streams of incandescent molten volcanic material that usually issue non-explosively from or near a crater's summit, while tephra refers to the various sized material extruded into the air by volcanic eruptions, the ash among which may be carried long distances by the prevailing winds.

not only set off landslides and *lahar* flows, but are also principally responsible for the severe and recurrent flooding of lowland areas (Rantucci 1994:28). Extended periods of heavy rainfall are particularly linked with slow-moving or almost stationary typhoons.

Table 1. Proportion of forest cover to land area, 1575-1990

Year	Forest cover (million hectares)	Proportion to total land area (%)	Deforestation rate (estimated average hectares per year)
1575	27.5	92.0	22,917
1863	20.9	70.0	35,088
1920	18.9	64.0	78,571
1934	17.8	57.3	191,667
1970	10.9	36.3	350,000
1980	7.4	24.7	120,000
1990	6.2	20.7	120,000

Source: Department of Environment and Natural Resources as cited in Ibon 1997:2.

Human activity has also adversely affected the physical environment, progressively rendering populations more vulnerable to natural hazard and increasing the incidence of disaster. In particular, the accelerating pace of deforestation since the 1930s has exacerbated the exposure of large areas of the archipelago to a range of different hazards as well as raised its predisposition to new ones (Table 1). Loss of forest cover affects local climatic conditions accentuating the likelihood of drought, while increasing the possibility of flood and landslide. Forests also serve as efficient watersheds to collect and regulate the supply of water and moderate its pollution. Deforestation on the scale experienced by the Philippines over the last 50 years has caused massive soil erosion and led to the siltation and sedimentation of inland and coastal waters. Moreover, the appearance and spread of what are called red tides in near-shore waters since the 1970s, harmful planktonic blooms that can cause paralytic shellfish poisoning, has been partially attributed to the rapid eutrophication of waters from siltation, pollution and deforestation (Anderson 1989:13-4; Chua et al. 1989:335-6, 341).

A history of hazard 1565-1930

Spanish chroniclers have left a record of their trials and misfortunes from the earliest days of colonial settlement in the archipelago that provides a rich source of material from which to attempt a reconstruction of the history of natural hazard in the islands after 1565. Before the nineteenth century, how-

ever, the documentation is often patchy and nearly always selective so that certain regions are over represented in comparison to others, generally in accordance with the extent of the colonial domain at any given time. Thus Manila and central Luzon loom large in the records, the rest of Luzon and the Visayas less so, and Mindanao and the southern islands remain largely terra incognita till much more recently.

The more systematic recording of seismic and meteorological data from around the entire archipelago had to await the establishment of the Manila Observatory in 1865 and the first deployment of purpose-built measuring devices.⁴ More precise instrumentation including a Bertelli tromometer, Cecchi and Rossi seismoscopes, an improved Simple Pendulum, two geophones and a Gray-Milne three-component seismoscope was added between 1881 and 1889.⁵ This unique array of scientific equipment deployed at so relatively early a date has allowed a much more comprehensive and precise record of natural hazard in the Philippines than in many other areas of Southeast Asia. Most of this body of data is the legacy of three dedicated Jesuit priests who were principally responsible for the seismic work performed at the observatory: Federico Faura (1879-1890), Saderra Masó (1890-1896 and 1901-1928) and William Repetti (1928-1942). To this list should be added the name of Miguel Selga S.J. to whose offices much of the historical data on the early centuries of Spanish occupation can be attributed. The support previously furnished the Observatory by the Spanish government was continued by the new military authorities after the American occupation of Manila in 1898, who both extended its services and modernized its instrumentation. Philippine Commission Act 131 established a Weather Bureau and a network of 51 meteorological and 20 rain stations throughout the archipelago, while new instruments including a Vicentini's universal microseismograph and a ceraunograph were installed in 1902.⁶ Altogether, these sources help confirm the evident scale, frequency and magnitude of natural hazard in the archipelago, and give some indication of the significant role such phenomena may have played in shaping the historical development of Filipino society.

Tropical cyclones and typhoons

The loss of life and property caused by tropical cyclones and their epiphenomena such as landslides, storm surges and floods are greater than any other natural hazard in the Philippines. Each year about 20 typhoons, tropi-

⁴ Initially a simple pendulum seismoscope and another of a spiral spring vertical variety.

⁵ Repetti 1946:133-4. For a complete list of the instruments installed in the Manila Observatory during the Spanish colonial period, see Masó (1905:199-200).

⁶ *Second report* 1901:1, 50-1; *Third report* 1903:1, 667. The full benefit of the extended meteorological service was ironically hampered by the repeated destruction of telegraph poles through the activities of white ant and typhoons (*Third report* 1903:1, 305).

cal cyclones with very strong winds, equivalent to over 25 per cent of the total number of such events in the world, occur in the Philippine Area of Responsibility.⁷ About 95 per cent of these originate in the Pacific Ocean and so mainly affect the eastern half of the archipelago; the remainder comes across the South China Sea. Therefore the western and central areas of the archipelago are generally less exposed to the full force of typhoons whose intensity tends to dissipate as they cross the central mountain ranges. A distinction should be made between 'remarkable' or destructive typhoons and the more ordinary variety of tropical cyclones. The former are 'one of the greatest natural calamities that may occur in any place', while the latter are responsible for much of the rain that makes the climate so conducive to agriculture (Coronas 1920:446). According to modern meteorological terminology, a distinction is made between tropical depressions with wind speeds of up to 63 kilometres per hour (kph), tropical storms with wind speeds between 64 and 118 kph and typhoons with wind speeds over 118 kph.⁸ Whatever the denomination, however, tropical cyclones and typhoons have exerted considerable influence on the history of the archipelago.

No such fine distinctions were made in the past. Known respectively by Filipino and Spaniard alike in the Islands as *baguios*, by the Portuguese in India and China as *tifones*, and as *huracanes* in Spain, there are a surprising number of historical sources on typhoons testifying to their importance whether or not their effect has been generally recognized in conventional histories.⁹ The etymology of the words is also indicative given the local significance of typhoons in the region. *Tifón* is considered to derive from the Chinese *tai* meaning strong and *fung* meaning wind. The origin of *baguio* is more problematic having general usage throughout the languages of the archipelago from the oldest of accounts (Selga 1926:16, 110). The prime historical source on this phenomenon is Fr. Miguel Selga's *Primer catálogo de Baguios Filipinos*. This astonishing chronicle of typhoons in the archipelago commences with a Chinese account of the one that struck the ship carrying the Buddhist sage Fa-hien on his return to China off the West coast of Palawan in July 414 as well as an account of a similar event experienced by the Moorish traveller Ibn Batuta on a voyage between Amoy and Sumatra in July 1348. However, the

⁷ Brown et al. 1991:196. The Philippine Area of Responsibility (PAR) includes a rectangular area of ocean with the Philippine Islands at the centre, Palau at the eastern edge, Taiwan in the north and Sabah in the south.

⁸ PAGASA (Philippine Atmospheric, Geophysical and Astronomical Services Administration) uses a three now four level warning system based on the windspeed of storms expected within 12-18 hours: Signal Number 1, 30-60 kph (kilometres per hour); Signal Number 2, 60-100 kph; Signal Number 3, 100-185 kph; and Signal 4, over 185 kph – the latter being first raised on 27-10-1991 when Typhoon Trining hit Northern Luzon (Almario 1992:41).

⁹ A detailed discussion of the historical sources on the nomenclature of typhoons is given in note 40 of the *Relación inédita del P. Francisco Ignacio Alzina S.J.* (Selga 1928:18, 43).

main matter of the compilation provides an historical account of typhoons between 1565 and 1863 (Selga 1928-30). The catalogue of typhoons is continued for the late nineteenth century in a publication on climate compiled by the Manila Observatory in 1899 and published as part of the *El Archipiélago Filipino* printed in Washington at the expense of the US government and later reproduced in the *First report of the Philippine Commission to the President* (First report 1901:4, 290-344). Additional material on southern Luzon for the mid-nineteenth and early twentieth centuries is provided in the chronicle of Nabua ('List of typhoons', *Archive of the Manila Observatory* Box 9-35), while the *Census of the Philippine Islands, 1918* (Census 1920:1, 445-67) contains material on the number of typhoons experienced during the first two decades of the US colonial period. An additional source on the Visayas is Selga's commentary on the *Relación inédita del P. Francisco Ignacio Alzina S.J.* (Selga 1928) but the material on this period is still incomplete, especially for the early years of US occupation from 1903 to 1907. A comprehensive list of typhoons, from which reliable observations can be made, really only exists from 1948 onwards (Manalo et al. 1995:8).

Only a proportion of tropical cyclones and typhoons in the vicinity of the Philippines actually make landfall somewhere in the archipelago, only 384 or 45 per cent of the 850 documented events that entered the PAR between 1948-1990 (Soriano 1992:12). Reference to typhoons in the more historical sources frequently records the passage of tropical cyclones that never crossed land, usually in the context of vessels damaged or lost at sea. In fact, Selga's catalogue of historical typhoons is often nothing less than a chronicle of maritime disaster with 80 per cent of all entries describing such events prior to the eighteenth century (Selga 1928-30). Among the notable catastrophes was the loss of a whole squadron of six vessels, 'the best that the King had placed at sea', together with over 1,000 men to a typhoon between 10 and 15 October 1617 (Selga 1930:20, 44-5). In fact, many particularly severe typhoons were popularly named after the ships that were caught at sea by them such as *Gravina*, *Cantabria*, *Quantico* and *Euzkadi*.¹⁰ Despite the incomplete record of such events, the historical sources clearly show the effect that this hazard exercised on communities in the archipelago, especially after documentation becomes more reliable in the 1880s (Graph 1).

Most of the typhoons recorded in these historical sources were notable either for their intensity, for the particularly severe damage that they inflicted or for some miraculous intervention. Thus the crew of the galleon *Santo Cristo de Burgos*, struck by a violent typhoon off the shores of Ticao on its way to Mexico in 1726, attributed their lives to Don Julián de Velasco's pledge to endow the local church with an annual endowment in gratitude for their sal-

¹⁰ Other typhoons were named after the islands that suffered the most damages, most notably Samar and Leyte, Negros, Cebu, Ilocos, and the Batanes (Selga 1938:206, 65).

Graph 1. Philippine tropical cyclones, 1565-1930

Sources: Selga, 1928-30; 'List of typhoons', *Archive of the Manila Observatory* Box 9, 35; *First report* 1901:4, 292; *Census* 1920:1, 452; *Report of the Governor-General* (1919:181, 1920:143, 1921:230, 1922:177, 1923:210, 1924:197, 1926:216, 1927:261, 1928:201, 1929:192, 1930:255).

vation.¹¹ Or the great typhoon of 1928 that laid waste the eastern Visayas and southern Luzon, inflicted serious damage to at least twelve other provinces, caused over 500 deaths and damaged 25,000 homes (*Report Governor-General* 1928:15). These sorts of statistics and anecdotal accounts, however, give little impression of what the actual historical experience meant to people in the past. On the other hand, the 'Chronicle of Nabua' provides an insight into how often communities in eighteenth and nineteenth century Camarines and Albay were subjected to 'remarkable' typhoons known locally as *oguis*. The chronicle shows a high degree of consistency in the number of such events: there were nine recorded typhoons between 1701 and 1750, nine between 1751 and 1800, twelve between 1801 and 1850, and eleven between 1851 and 1900. That is a person was likely to experience such a phenomenon twice every eleven years in the eighteenth century and twice every nine years in the nineteenth century, or between five to six times an average life expectancy.¹²

¹¹ Selga 1930:20, 10. The ship's image was placed on the main altar at Ticao and became an object of local veneration to the islanders.

¹² 'List of typhoons', *Archive of the Manila Observatory* Box 9-35. The 'Chronicle of Nabua' was compiled from the municipal reports sent in reply to the questionnaire of 1911. The chronicle lists typhoons in the following years: 1701, 1703, 1709, 1713, 1721, 1723, 1726, 1733, 1748, 1758, 1762, 1766, 1774, 1776, 1781x3, 1790, 1801x4, 1803, 1811, 1816, 1824, 1839x3, 1857, 1867, 1870, 1875x2, 1881, 1885, 1891x2, 1892x2.

Graph 2. Seasonality of tropical cyclones, 1880-1901

Source: Algué 1904:86.

The nature of tropical cyclones also changes both in terms of duration and seasonality. An historical comparison of the lifespan of typhoons shows that while the average event lasted from four to six days in the latitude of Shanghai and Japan, those in the Philippines endured one day longer. Of the 445 typhoons experienced in the islands between 1902 and 1921, 62 per cent were over in one week or less and 86 per cent were over in ten days or less. Perhaps surprisingly 63 typhoons lasted over ten and one as long as eighteen days. Many of the tropical cyclones that approached the archipelago were of the type that either moved slowly or tended to hover in the vicinity of Taiwan (Selga 1927:69). Even more distinctive than duration was the seasonality of typhoons. While tropical cyclones could occur in any month of the year, they were much more frequent between July and November, a period synonymous with the *tag-ulan* or wet season in the vernacular, and very rare between January and March.¹³ Fully 352 out of 468 tropical cyclones (more than 75 per cent) recorded between 1880 and 1901 took place in those five months and only sixteen between January and March (Graph 2). An analysis with later periods for which there is more detailed data suggests a possible shift in the monthly frequency of such events corroborating popular belief that the 'typhoon season' is gradually moving later in the year. An historical comparison between 1880 and 1994 reveals that the percentage of tropical cyclones in

¹³ Tropical cyclones are highly unlikely to occur in February, though data for the period 1948-1994 documents such events in 1953, 1980 and 1993 all of which were tropical depressions (Manalo et al. 1995:8).

August and September is decreasing while those in December are noticeably increasing (Graph 3). The data, however, are not conclusive and the implications for agriculture, if any, remain unclear.

Graph 3. Percentage monthly variations of tropical cyclones, 1880-1994

Sources: *First report* 1901:4, 292; Manalo et al. 1995:8.

Just as significant as the variations in duration and seasonality are the paths taken by tropical cyclones and the consequences for various parts of the islands. At least five main tracks have been identified: one that crosses to the north of Manila, one that traverses south of the capital, one that passes east or northeast of the archipelago either disappearing or re-curving in the Pacific, one that forms in the China Sea to the west of the Philippines, and another that re-curves in the China Sea between the parallels 10° and 20° (*Census* 1905:1, 158-60; 1920:1, 447-52). As a result some provinces are more frequently exposed to typhoons than others.

A comparative analysis of the total number of tropical cyclones experienced by each major region of the archipelago between 1903 and 1918 reveals marked differences (Graph 4). Northern Luzon receives by far the highest number of all tropical cyclones and equally the highest number of remarkable typhoons (those with strong winds).¹⁴ No fewer than seven of the ten provinces or sub-

¹⁴ The regions are defined as constituting the following provinces and sub-provinces as designated under the US colonial regime: Northern Luzon as Nueva Vizcaya, Amburayan-Benguet, La Union, Ifugao-Lepanto-Bontoc, Isabela, Abra, Ilocos Sur, Cagayan, Ilocos Norte, Babuyan Islands

provinces most exposed to this latter type of typhoon are situated within this region (Cagayan, Ilocos Norte, Babuyan Islands, Abra, Ilocos Sur, Isabela and the Batanes). There is little difference both in total numbers or the nature of tropical cyclones between Central Luzon, Southern Luzon and the Visayas with each region respectively receiving 107, 109 and 105 events. However, two islands in the Visayas, Samar and Leyte also figure in the ten most exposed provinces to remarkable typhoons accounting for 25 out of 59 or 42 per cent of all such storms in that region. Mindanao, on the other hand, presents a very different profile with fewer tropical cyclones and a higher percentage of milder events proportionately than any other region (*Census 1920:1, 462*).

Graph 4. Tropical cyclones by region, 1903-1918

Source: *Census 1920:1, 462*.

Any true appreciation of the regional variation in both the number and effect of tropical cyclones on the islands needs to consider the occurrence of more localized storms, sometimes referred to as 'tornadoes', in the historical context. These are defined as tempests, usually of short duration, accompanied by thunder and lightning. They are extremely frequent at certain times of the

and the Batanes; Central Luzon as Southern Tayabas, Northern Tayabas, Batangas, Laguna, Cavite, Rizal, Manila (city), Bataan, Bulacan, Pampanga, Zambales, Tarlac, Nueva Ecija and Pangasinan; Southern Luzon as Masbate, Romblon, Mindoro, Marinduque, Sorsogon, Albay, Catanduanes and Ambos Camarines; the Visayas as Oriental Negros, Occidental Negros, Bohol, Cebu, Leyte, Iloilo, Antique, Capiz and Samar; and Mindanao as Sulu, Cotabato, Davao, Zamboanga, Lanao, Bukidnon, Agusan, Misamis, Surigao, Southern Palawan and Northern Palawan.

year, especially during the *tag-ulan* (rainy season) and are responsible for a large percentage of rainfall in the archipelago.

Graph 5. Storms in the vicinity of Manila, 1888-1897

Source: *First report* 1901:4, 348-350.

The number of these storms in any year is phenomenal as the data collected by the Manila Observatory on the capital and its immediate surrounds between 1888 and 1897 testify. No fewer than 5,050 storms of all types were recorded for this ten-year period or an annual average of 505. Three different variations of storms were distinguished: those that were simply violent rain-storms, those that were rains-storms accompanied by much thunder, and, by far the most numerous, those that could only be perceived by flashes of lightning and peals of thunder. The pattern of their occurrence resembles that of the typhoon season except that the storms commence and peak earlier (May-June) and diminish sooner (November) (Graph 5). In both cases, there then follows a long dry period between December and March. Something of the sudden menace of these storms is conveyed in the words of Saderra Masó who described the onset of one such 'tornado' on 21 May 1892 as terrifying Manila's 'inhabitants by the number of electric sparks which accompanied it and by the tremendous peals of thunder'. He recorded a rainfall of 60 mm in 30 minutes (*First report* 1901:4, 354). Such a downpour, however, was nothing out of the ordinary: another such event on 14 September 1931 measured 2.3 inches or over five centimetres of rain in the same time period (Selga 1931:21, 113). Perhaps, more than any other hazard, tropical cyclones and storms exert

an influence on communities and peoples in the archipelago, creating an intricate and complex web of relationships that oscillate between disasters on the one hand and the timely need for rainfall on the other.

Floods, storm surges and tsunamis

The peoples of the Philippines have experienced a large number of other hazards, as much in the past as in the present, many of which are epiphenomenal to those already discussed. Thus floods and storm surges are often caused by tropical cyclones and droughts by the lack of them. Tsunamis are mainly triggered by volcanic eruptions or earthquakes that almost invariably also cause landslides and slope failures. Unfortunately, the historical record of these events is extremely patchy, not because of their infrequency but as a result of the very regularity of their occurrence that made their observation something less than remarkable. While earthquake, volcanic eruption and even typhoons inspired an almost divine awe at the majesty and power of nature (or even of some higher authority), flood and drought, though no less destructive or infrequent, were not so spectacular and belonged more to the commonplace order of daily existence in the archipelago. That is, at least in the accounts of those European observers who have left the written record of such phenomena.

Floods, in particular, have historically been the source of much privation and suffering in the Philippines. Since the islands of the archipelago are relatively small with the exception of Luzon and Mindanao, there is no coastal plain wider than sixteen kilometres.¹⁵ Rivers, therefore, are short, sluggish and shallow, following courses chiefly determined by tectonic lines, folding and faulting. Floods are largely of two types: the sudden raging torrent that peaks sharply and dies away in a few minutes as a result of localized rainfall; and those of a much more widespread nature and longer duration usually associated with persistent rainfall. Such events were not generally considered worth documenting unless they had relevance or consequences to Europeans. Thus one of the earliest accounts describes how a localized flood in Cebu rendered useless the firework display that had been designed especially to celebrate the beatification of San Ignacio on the night of 30 July 1611 (*"Dolo" de Samar*, *Archive of the Manila Observatory* Box 7-16). In this manner, too, Miguel Selga's catalogue of typhoons, drawn mainly from the chronicles of conquistadors and prelates, rarely mentions flood; it is much more concerned with shipwreck and other maritime disaster.

¹⁵ Nor are there any extensive tracts of land whose fertility may be renewed by seasonal flooding (Fisher 1964:697).

Graph 6. Total recorded floods, 1691-1900

Source: 'Floods in the Philippines', *Archive of the Manila Observatory* Box 10-37.

The minutes of local 'town chronicles', on the other hand, give frequent accounts of such hazards. A list drawn up from these sources found in the Archive of the Manila Observatory constitutes a record of major floods that occurred between 1691 and 1900.¹⁶ While almost certainly incomplete, it does provide an indication of the primary causes, geographical predisposition and even the frequency of such events in specific areas. In particular, the chronicles regularly refer to flooding in connection to the passage of tropical cyclones; over 56 per cent of all recorded incidences are directly attributed to typhoons (Graph 6). On other occasions, floods were mainly attributed to heavy rainfall, at times associated with the monsoons. According to the chronicle of Binmaley, the flood of 1774 in Northern Pangasinan was due to the Agno River changing its course. Moreover, the close association between flooding and typhoons suggests a certain seasonality in their occurrence that corresponds to the peak in the latter's annual cycle between July and November (see Graph 2).

The geographical predisposition of flooding is even more tenuous to gauge as the records largely reflect the principal centres of Spanish colonialism (Graph 7). There is no record of any event in Mindanao prior to 1900 when, however, they constitute as many as 20 per cent of all floods.¹⁷ Still, the preponderance of the northern part of Luzon over the rest of that island is consistent with the

¹⁶ The list, simply entitled 'Floods in the Philippines 1691-1911', is anonymous and does not seem to have been composed by Selga but makes frequent reference to his works and so presumably post-dates him.

¹⁷ There were three floods out of a recorded fourteen for the period 1901-1911 ('Floods in the Philippines', *Archive of the Manila Observatory* Box 10-37).

higher incidence of typhoons there and its greater vulnerability as the most hazard-prone region of the Philippines (see Graph 4). Some idea of what the incidence of flood on local communities might mean can be gauged by a closer scrutiny at the more complete local chronicles that suggest how often people were faced with such situations. The records for Nabua in Camarines between 1691 and 1856 and those for Pangasinan between 1768 and 1872 depict just how frequent a life-event floods were.¹⁸ In Nabua, a person experienced one such event every 9.7 years on average but once every 5.6 years between 1733 and 1800. This latter figure is more in line with that for Pangasinan where the average was once every 5.7 years.¹⁹ ('Floods in the Philippines', *Archive of the Manila Observatory* Box 10-37).

Graph 7. Total recorded floods by region, 1691-1900

Source: 'Floods in the Philippines', *Archive of the Manila Observatory* Box 10-37.

Other local histories present a glimpse of the reality of this hazard for communities in different regions of the archipelago. In northern Luzon, the Chronicle of San Nicolas in Ilocos Norte describes a violent storm and flood

¹⁸ Half of the eighteen floods in Pangasinan were recorded in the chronicle of Calasiao.

¹⁹ Floods occurred in Nabua in 1691, 1697, 1733, 1748, 1758, 1767, 1775, 1783, 1786, 1787, 1790, 1793, 1798, 1800, 1817, 1840, 1856; and in Pangasinan in 1768, 1774, 1776, 1777, 1779, 1785, 1790, 1794, 1797, 1806, 1820, 1821, 1825, 1831, 1857, 1865, 1871 and 1872 ('Floods in the Philippines', *Archive of the Manila Observatory* Box 10-37).

that destroyed half the town in 1798, while that of Balaoan, La Union, reports heavy rains in 1830 that demolished many houses and led to the relocation of the military barracks to safer ground. Still in La Unión, the Chronicle of San Fernando narrates a severe storm that drowned several people in October 1908. The same was true of central Luzon. The Chronicle of Pagsanjan in Laguna gives details of the overflowing of the Balanoc and Bumbungan rivers on a number of occasions: flooding the town with enormous loss to both life and property on 22 October 1831, rising to over half a metre along the Calle Real in October 1840, and again inundating the town in 1882. The Chronicle of Nasugbu in Batangas recounts a flood so great in 1839 that many animals were carried away and the town submerged so that people had to use *bancas* (indigenous canoes) to move around even in the centre. Further south, the Chronicle of Daet in Camarines relates how rain carried away the newly constructed bridge in 1847 and how those of 1857 were 'exceedingly heavy' ('List of Typhoons', *Archive of the Manila Observatory* Box 9-35).

A similar picture emerges for the Visayas with the Chronicle of Pototan in Iloilo mentioning a big flood in 1837 and heavy rains in December 1893. Various other chronicles from Iloilo recite similar occurrences: the overflowing of two rivers and the great destruction wrought in Dumangas on 3 April 1841, the floods in Barnate in 1848 and in 1890, and in Alimodian in 1866 and again in July 1877. The Chronicle of Bacolod in Negros tells of 'abundant rains' that demolished several houses in 1875, while that of Caibiran, Leyte, of a big flood that washed away 'most of the houses, and even the church and bell tower' in 1876. Any impression that these were simply small scale disasters and localized tragedies are refuted by chronicles such as that of Tayum whose account of the rising of the Abra River to a height of more than 25 metres above its normal course caused over 1,800 deaths between 25-27 September 1867 ('List of Typhoons', *Archive of the Manila Observatory* Box 9-35). The flooded area around Bangued was reported as almost circular with a diameter of approximately ten kilometres and a height of more than 20 metres. The entire town of Caoayan disappeared beneath the waters ('Floods in the Philippines', *Archive of the Manila Observatory* Box 10-37). Or the flood that inundated large portions of Central and Northern Luzon in October 1871, drowning 1,342 cattle, 842 horses, 761 carabaos and numberless hogs and domestic animals in Ilocos Norte alone ('Floods in the Philippines', *Archive of the Manila Observatory* Box 10-37). Or again the flood in Santa Maria, Ilocos Sur, that destroyed the *barrio* of Sumagui, carrying away over 22 houses and causing more than one hundred thousand pesos worth of damages in 1911 ('List of typhoons', *Archive of the Manila Observatory* Box 9-35). The most obvious flood-prone areas in the islands are the ancient channels of river systems filled with Quaternary alluvial deposits. As these are also among the flattest, most fertile and easiest to irrigate landscapes, they have also been the richest centres of agriculture and

intensive human settlement. Currently, half of the country's provincial capitals and major cities are situated on these floodplains (Balce et al. 1994:20-1).

Drought, on the other hand, is considered more of a contemporary hazard in the Philippines and is perhaps even more difficult to determine: sometimes an absence of a thing is less easily described than an excess of it. Most rainfall occurs between June and August with the last two months in particular important for rice cultivation. Late or low rainfall during this season can have serious consequences for the sowing and growth of *palay* (unhusked rice). Yet the evidence suggests that drought too was a recurrent if not as regular an event as flood. A circular issued by the Archbishop of Manila on 31 August 1849, that is towards the end of the *tag-ulan* testifies to the severity of one such drought. The prelate initiated processions of the Holy Sacrament throughout the diocese and urged the faithful to pray for deliverance from their even greater fears of 'the terrible scourge of hunger and sickness that just the same we merit as a result of our many sins'. A similar sort of circular from the Bishop of Cebu suggests the presence of drought in the Visayas during 1865 (Selga 1920:10, 96).

Graph 8. Rainfall (June-August) around Manila, 1865-1919

Source: Selga 1920:10, 97.

In fact, an analysis of Manila's wet season rainfall between 1865 and 1919 reveals considerable annual variations characteristic of the familiar El Niño-La Niña weather oscillation. Thus while the average rainfall for June, July and August amounted to 1,039 mm, annual totals varied from a low of 496.2 mm in 1892 to an astonishing 3,068.8 mm in 1919. Rainfall patterns suggest possible periods

of drought in 1874-1875, 1885-1887, 1892-1894, 1897, 1903, 1909-1910 and 1915-1916 followed by years of high rainfall with consequent higher likelihood of flood in 1876-1877, 1888, 1895-1896, 1898-1900, 1904-1905, 1911-1914 and 1917-1919 (Graph 8). This close relationship between drought and flood is typified in the annual report for Mountain Province in 1915. While relating how nearly all districts had been afflicted by drought over a number of months that had seriously reduced the rice and camote crops (sweet potato), it also details the consequences of two severe typhoons, one following closely upon the other, that wrought major damage to life and property, causing a number of deaths and washing away the terraced walls of rice fields and burying others under slides of dirt, rocks and gravel (*Report Philippine Commission* 1915:115).

The incidence of other hazards is also fragmentary, especially the further the distance from Manila and the more remote its occurrence in time prior to 1865. In particular, coastal communities were subject to their own distinctive forms of hazard in the form of storm-surges and tsunamis. Storm surges are caused by an abnormal rise in sea levels as typhoons approach the coastline.²⁰ Atmospheric pressure drops causing sea levels to rise as a storm forms and, as it approaches land, the strong winds pile up the already raised sea that then sweeps inland. With its long coastline, the archipelago is a natural storm surge-prone landmass with those regions most exposed to the path of tropical cyclones most at risk. The earliest documented storm-surge in the Spanish historical sources provides details of a typhoon that tore through southern and central Luzon between 27 September and 6 October 1881 and a subsequent wave so immense that more than 20,000 corpses were recovered after it struck the coast of Indo-China (*Archive of the Manila Observatory* Box 9-35). The first such recorded event to cause widespread damage and loss of life in the Philippines is that of the 'hurricane wave' of 12 October 1897 that devastated coastal regions of Samar and Leyte. Sea levels rose from three to as high as 7.3 metres in Hernani (southern Leyte) and remained at that height for over three hours. Accounts describe a small boat being cast more than one hundred metres from the shoreline and of two carts being lifted up and thrown down beside two dazed sailors. These latter were among the storm-surge's lucky survivors as the event is estimated to have claimed between 1,300-1,500 lives (*First report* 1901:4, 310-1; 'List of typhoons', *Archive of the Manila Observatory* Box 9-35).

Since then a number of other such similar events have been documented, though again the data seems incomplete, especially considering the absence of incidents for the 1940s and 1950s and their disproportionately greater occurrence in the 1970s and 1980s (Table 2). Still, a pattern emerges showing some regions of the archipelago being more vulnerable than others to storm surges.

²⁰ Less commonly, typhoons leaving a landmass may also generate storm-surges.

Table 2. Storm-surges by region, 1897-1984

Years	Events	Northern Luzon	Central Luzon	Southern Luzon	Visayas	Mindanao
1897-1910	7	1	1		5	
1911-1920	6	1			5	
1921-1930	3	1	1		1	
1931-1940	2		2			
1941-1950						
1951-1960	6	2	3	1		
1961-1970	9	3	2	2	2	
1971-1980	10	1	3	1	2	3
1981-1984	10	2	3	2	1	2
Totals	53	11	15	6	16	5

Sources: Gonzalez 1994:17; Soriano 1992:15.

Particularly vulnerable coastlines include: the northern tip of Luzon, Isabela, the eastern coast of Bicol and the eastern Visayas on the Pacific Ocean side; and the Ilocoses, Manila, Batangas and western Mindoro on the South China Sea side. Most of Mindanao with the exception of northeastern Surigao and small parts of northern Zamboanga, is unaffected by such phenomena.

As distinct from storm surges, tsunamis are waves generated by sudden vertical movements of the seafloor during earthquakes, submarine landslides triggered by nearby earthquakes or by volcanic eruptions.²¹ Two to three waves often over a hundred kilometres apart spread outwards in all directions from the point of origin reaching speeds of over 1,000 kilometres per hour. Often undetectable in the open ocean, the waves slow as they approach shallowing water and irregular coastal features such as bays and estuaries that sharply heighten their amplitude so that they become almost vertical walls of water that strikes the shore with devastating force, sweeping aside all before them. The most powerful tsunami recorded prior to the 1970s occurred in 1897 as a consequence of the severe earthquake that rocked Mindanao, the Sulu Archipelago and the southern Visayan Islands on 21 September. The sea was described as rising in several locations: small boats were driven rapidly inland in Zamboanga, two hills collapsed alongside the river there and many dwellings were washed away; in Isabela de Basilan, the ocean rose six metres above its bed, rolling great *yakal* timbers and blocks of masonry aside and carrying away the market place; and the waters were said to rise and fall every fifteen minutes in

²¹ Tsunamis are often erroneously referred to as 'tidal waves' that are caused by the gravitational attraction of the sun and moon.

Sulu, dividing the island of Tubigan into two, and washing away that of Damei (Repetti 1946:315-6; Masó 1905:217-9). Many hundreds of casualties were discovered in the wake of these occurrences (PHIVOLCS: PL E076).

Tsunamis have also been recorded following earthquakes in Zambales on 26 January 1872, in Cotabato on 31 January 1917 and again on 15 August 1918 causing seven and 50 deaths respectively, and in northeastern Samar on 13 November 1925.²² No less than nine of the 29 recorded tsunamis to have struck the archipelago prior to 1970 occurred in Mindanao in comparison to eight in the Visayas, seven in northern Luzon and five between central and southern Luzon.²³ The data are even more telling that the statistics suggest as only events after 1897 are documented for Mindanao, while those for other regions date from as early as 1627. More localized events also took place as a consequence of the eruption of Taal given the volcano's situation in the centre of Lake Bombon. Following the explosion of 1716, immense waves were said to have striped away the beach and endangered the church, while fish were cast ashore 'in a state as if they had been cooked, since the water had been heated to a degree that it appeared to have been taken from a boiling cauldron'. Once again the lake town of Taal was threatened during the massive eruption of 1754 by the 'raging waters' that invaded the main part of the municipality 'sweeping away everything they encountered' (Masó 1911:7, 9). Despite the particular topographical circumstances of Taal, the areas most vulnerable to tsunamis are the coastlines of southern Mindanao facing the Celebes Sea (Punongbayam 1994:8).

Hazard and society in the past

The historical record, incomplete though it may be, leaves no doubt that hazard has played an important role in shaping the past of peoples and communities living in the archipelago, along its shores as well as inland. Assessing just how central that part may be deserves a detailed study in its own right and is beyond the intention and encompass of the present work. Not until the collection of detailed statistics on the damages wrought by disasters beginning in the 1970s can the 'costs' of natural hazards be approximated with any degree of confidence. Still, there are some documents that afford a rare glimpse into the past and provide some measure of the scale and scope of that experience. Yet an appreciation of the true extent of their effect on the political, economic and social structures of society can only be inferred from tantalizing statements such as that given by William Daland before the Philippine Commission on 19 June 1899. When asked what the impact of construct-

²² PHIVOLCS: PL E076. A further such event may have taken place in Isabela on 29-12-1949 after fifteen people were drowned by the capsizing of their *bancas*.

²³ Rantucci (1994:24-5) records only 27 tsunamis in the text while providing a map from PHIVOLCS that clearly records thirty including that of 1976.

ing an electric tramway connecting Manila to Antipolo would have, he replied that: 'It would take some time before the people would move out there and take houses. This being a center of earthquakes and typhoons foreigners don't care to own much property' (*First report* 1901:2, 170).

One such event for which a substantial number of documents have survived describes the typhoon that hit central Luzon on 22-23 October 1831. Once again, the compilation and preservation of this material is due to the diligence of Fr. Selga. Not only has he preserved the harrowing eye-witness account written by Nicolás de Saavedra within a couple of days of the storm, supplemented by the logs and personal observations of Captains Bankcroft and Griswold of the ships *Crocodile* and *Panamá*, but he also provides detailed records of the damages and costs incurred for some provinces (Table 3).

Table 3. Damages by region following the typhoon of 22-23 October 1831

Provinces	Deaths	Houses destroyed	Cost in pesos
Tondo	58	20,197	131,242
Cavite	131	4,320	32,849
Bulacan	N/A	4,272	14,106
Laguna	36	4,175	62,775
Bataan	N/A	393	968
Totals	225	33,357	241,940

Source: Selga 1921:58-9.

This data collated from the returns of the *alcaldes mayores* (governors) and parish priests of the respective provinces to the Governor-General furnish some idea of the scale of such disasters though it should be borne in mind that Selga (1928-30:21, 27) describes this event 'as one of the most horrific in the records of Philippine history'. At the very least, however, the death of 225 persons, the loss of 33,357 dwellings and damages amounting to just under a quarter million pesos was a significant cost for colonial society to bear.²⁴ Using an estimate of five persons per household, that means a minimum of 166,785 people was affected by the typhoon.²⁵ In response to this degree of distress, Governor-General Pascual Enrile opened a voluntary subscription on 8 November for the victims of the event in which the names of those who contributed were publicly acknowledged.²⁶ Despite this incentive,

²⁴ Selga makes it quite clear that these figures are far from complete, writing: ¿Quién dará cuenta de otras personas que perecieron y cuyos nombres no hubo pluma que los transmitiera a la historia?

²⁵ Early Spanish statistics are often cited in terms of tribute payers that are usually calculated at the rate of five to one, a tribute payer being regarded as a householder.

²⁶ Those contributors who wished to remain anonymous could simply write their initials.

the amount of 'state' relief did not amount to much more than a fraction of the most conservative estimate of the damages incurred. In the event, it appears that the subscription raised in relief from official sources did not total more than 34,714 pesos, equivalent to a little over fourteen per cent of the reported damages in the five provinces for which statistics are provided.²⁷

At other times, a series of brief reports describing a number of similar events that all transpired in the same locality give some impression of the cycle of risk and hazard that people confronted in their daily lives. Thus the communities who lived in the shadow of Mayon, the most active volcano in the archipelago that has erupted at least 44 times since records begun in 1572, live with the knowledge that on average they will experience one such event every ten years. But every year, they must also fear that the torrential rains of passing typhoons will unleash an avalanche of water, mud and rock composed from the loose pyroclastic material that lies on the mountain's slopes. Just such a catastrophe struck the surrounding towns in November 1875, reportedly killing over 1,500 people.²⁸ Again, a heavy flood carried sand, gravel and boulders down the mountain in 1915 and washed away the rail-track between Legaspi and Libog, suspending communications between the towns for over two weeks. Four typhoons passing in quick succession in October and November 1934 caused floods that, according to the Provincial Board of Albay: 'inundated and submerged thousands of hectares of lands, particularly rice lands, in the municipality of Oas, Guinobatan, Camalig, Daraga, Legaspi, Libog, Tabaco, Malinao and Tiwi, especially with great quantities of sand and eroded rocks and big stones from the slopes of Mayon volcano, rendering those lands unproductive now and for many years to come and perhaps permanently'.²⁹

Not only did natural hazards cost lives and destroy property but it also wrought havoc on agriculture, the foremost economic activity of the majority of peoples and the principal basis of commerce and industry in the archipelago. An examination of the provincial reports for a single year, 1906, gives some idea of the often longer-term impact of hazard that continued to affect communities after the threat of the event itself had receded. The year was not an exceptional one overall though more severe in certain provinces. In the first place, a particularly destructive typhoon on 25-26 September 1905 materially reduced the crops in eight mainly central and southern Luzon provinces.³⁰ In particular,

²⁷ Selga 1921:79, 72. The government offered twenty-five thousand pesos, the Obra Pía de la Misericordia four thousand pesos, the Venerable Third Order of Saint Francis two thousand pesos, the Recollects two thousand pesos, D. Luis Abilés 829 pesos and the armed forces 885 pesos.

²⁸ An earlier event occurred on 23-10-1766 entirely destroying the town of Malinao.

²⁹ 'Accounts of the eruption of various volcanos', *Archive of the Manila Observatory* Box 13-8. The respective dates of the typhoons were: 14 October, 28 October, 15 November and 29 November 1934.

³⁰ The eight provinces were Samar, Sorsogon, Alba, Ambos Camarines, Tayabas, Batangas, Laguna and Cavite.

there was a fall in hemp production with exports for the six months to 30 June 1906 only slightly over 70 per cent of the figure for the same period of the preceding year.³¹ The storm also seriously damaged the coconut crop, the high winds shaking growing nuts to the ground. Apart from the typhoon, there was a drought in Mindanao, Cebu and some of the southern islands and a locust plague in the areas directly north of Manila (*Seventh report* 1906:2, 195-6).

The reports of provincial governors add details about local situations. Thus in the north, two typhoons severely affected the tobacco harvest in the southern half of Isabela: the first in December 1905 flooding fields and causing the loss of plants set out and seeded; the second in the following May completing the process as 'to the great misfortune of the long-suffering inhabitants [...] the storm came just at the time of cutting'. The loss to both crops and housing was estimated at one hundred and fifty thousand pesos (*Seventh report* 1906:1, 301). A similar fate awaited the tobacco crop of La Unión that, not only had to contend with the storms of May, but also with the effects of a prolonged drought between October 1905 to April 1906 that reduced the harvest by one-third (*Seventh report* 1906:1, 476). In the Cordillera, the early coming of the rains broke a drought that threatened the rice harvest in Lepanto-Bontoc (*Seventh report* 1906:1, 317). Drought, too, was a major factor reducing agricultural production in central Luzon where the rice crop was 30 to 40 per cent below expectation due to lack of rain in some towns of Cavite (*Seventh report* 1906:1, 222). The situation was much worse in Pangasinan:

The last rice crop suffered a loss of 50 per cent by the storm of last September and the drought during the months of November and December. The ravages of the locusts during the months of July to November, 1905, also contributed to the loss of several crops, especially that of rice. The last storms during the months of May and June levelled the rice fields, which had to be planted over again, and injured the mango trees, the last storm having occurred at the time of gathering' (*Seventh report* 1906:1, 416).

In southern Luzon, it was the severe typhoon of 25 September that was mainly responsible for agricultural losses. The Governor of Albay felt that 'the incalculable losses caused by the terribly destructive baguio' would not be made good till the end of 1906 and only then providing that the harvest was a good one (*Seventh report* 1906:1, 157). The 'deplorable condition' to which Sorsogon had been reduced was due to the drought that reigned throughout most of 1905 compounded by the typhoon that had 'heaped the greatest desolation and misfortune upon the province'. Statistics collected by municipalities in the wake of the storm conservatively estimated the losses at 50 injured, 13,174 houses destroyed and total damages at 7,297,055.35 pesos (*Seventh report* 1906:1, 444).

³¹ Exports fell from 66,213 to 48,227 tons. For the importance of 'Manila hemp' on the economy of late nineteenth and early twentieth-century Philippines, see Owen 1984.

In the Visayas, drought ravaged Leyte, occasioning a loss of 30 per cent in the hemp crop (*Seventh report* 1906:1, 328), while in Samar, the hemp crop was ruined by the typhoon of 25 September along with 5,000 houses including all the public buildings in eleven municipalities (*Seventh report* 1906:1, 437). The annual report for Cebu begins with the terse sentence that the past fiscal year 'was ushered in by gaunt famine, which lasted till August and was unprecedented during a period of fifty years' (*Seventh report* 1906:1, 239).

Graph 9. Amount of typhoon and earthquake insurance as per cent of total insurance policies, 1911-1927

Sources: *Report Philippine Commission* 1913:240, 1914:256, 1915:206; *Report Governor-General* 1918:144, 1921:137, 1923:158, 1924:144, 1926:129, 1927:207, 1928:139; *Census* 1921:4, 2, 749.

Insurance, too, provides another avenue of exploring the costs and perceptions of hazard in the Philippines though its relevance to the majority of people remained and still remains today rather tenuous. By 1918, 60 insurance companies were doing business in the islands, nine local, twelve domiciled in the United States and the remainder in various foreign cities, mainly London. These companies mainly wrote policies in fire, marine and life insurance but three also covered damages caused by typhoons and earthquakes: the British Traders Insurance Company and the Union Insurance Company of Canton both with their home offices in Hong Kong, and the Fidelity and Surety Company of the Philippines based in Manila.³²

³² *Census* 1918:4, 2, 741. The rather haphazard situation that had prevailed earlier had largely been systematised with the passage of the Insurance Law Act No. 2427 of 1-7-1915 that had effectively set up the Insular Treasurer as ex-officio Insurance Commissioner and established a scheme of official registration.

Table 4. Typhoon and earthquake risks, premiums and losses, 1919-1928 (pesos)

Type	1919	1920	1921	1922	1923
Risks written	2,525,835	5,967,000	5,584,150	8,333,080	13,125,250
Premiums written	16,849.87	37,334.21	34,683.77	41,052.25	67,176.51
Losses incurred	1,700	37,402.48		44,104.82	50,284.34
Losses paid	1,700	37,402.48		44,104.82	1,997.72
Ratio of premiums to losses	10.08	100.18		107	73

Type	1924	1925	1926	1927	1928
Risks written	6,806,400	9,920,060	9,920,060	17,748,123	19,757,555
Premiums written	31,683.99	19,603.52	25,854	46,257	55,950.34
Losses incurred					42,156.32
Losses paid					69,998.82
Ratio of premiums to losses					75.3

Sources: *Census* 1921:4, 2, 751; *Report Governor-General* 1920:84, 1922:125, 1924:118, 1926:129, 1927:191, 1928:121.

While premiums for these phenomena only comprised a small fraction of a market that was dominated by policies in marine and fire insurance, the percentage that natural hazards constituted steadily increased in importance from just over half of one per cent to just over three per cent between 1911 and 1927 (Graph 9). This increase represented an eighteen-fold rise in the amount of insurance from 1,710,500 to 31,640,643 pesos over the same period and signifies a growing awareness of the degree to which natural hazards posed a danger to US property and commerce in the islands. However, given the regularity with which natural hazards occur in the Philippines, insurance was not a particularly lucrative business. An analysis of insurance policies written for typhoon and earthquake damages incurred between 1919-1928 reveals a ratio of premiums to losses of 47 per cent with the latter exceeding the former in two years, 1920 and 1922 (Table 4).³³

³³ The actual amount of losses paid again exceeded premiums in 1928 but why such losses were greater than those incurred is unclear.

Conclusion

Delving into the past to uncover the history of hazard in the islands is fraught with its own 'perils' that lurk in the unevenness of the sources and the imperfect nature of the data. Yet the sheer weight of material leads to the conclusion that, whatever the actual rate or magnitude may have been, natural hazards – floods, droughts, storm surges, tsunamis and especially typhoons – have proven to be a major factor in the development of societies in the archipelago. A fuller historical account will reveal just how significant that influence has been. However, there is already sufficient data to show how economic activity, particularly agricultural production, was intricately related to the succession of hazards that regularly afflicted the islands. So regularly, in fact, that these events should not be seen as exceptional but as part of peoples' daily life experience.³⁴ And to what extent did hazard affect commerce and trade? How much was US investment in the early twentieth century prejudiced by sentiments that foreigners were not keen to own property here, 'this being a center of earthquakes and typhoons'? Such questions merit consideration.

Moreover, there would also appear to be definite cycles of higher activity in the occurrence of hazards that are followed by more quiescent periods. The latter half of the nineteenth century seems to be part of one such cycle. While the data is insufficient to conclude whether earthquakes were more frequent during that time than in earlier centuries, there were two major events that devastated the colonial capital, Manila, in 1863 and again in 1880. Certainly, too, there was a related increase in the number of volcanic eruptions that appears to be more substantial than simply a question of improved data collection. There were a large number of eruptions in the second half of the century, 49 between 1850 and 1900, including that of Mayon in 1897 and of three new cones – Bulusan in 1852, Canlaon in 1866 and Camiguin in 1871 that either 'awoke' or newly emerged. All this raises some fascinating historical questions about the coincidence of these seismic cycles with major political upheavals. How significant to the pre-revolutionary indigenous consciousness was it that the land itself appeared to be in revolt against centuries of colonial oppression? Much has been written on the contributory factors to the outbreak of the Philippine Revolution in 1896 but did the natural history of the archipelago play any role in those developments?

It is also abundantly clear that some areas and so some communities were more exposed than others to particular types of hazards. Thus northern Luzon, Samar, and Leyte were struck by a disproportionately high number of typhoons. These latter areas were also among those most prone to damages from storm-surges. But if most of Mindanao was mercifully free from

³⁴ Ken de Bevoise (1995:ix-x) makes a similar claim in relation to health and disease in the late nineteenth and early twentieth-century Philippines.

such dangers, its coastal communities were another matter being particularly vulnerable to tsunamis. And all communities were vulnerable to flood and drought. If the consequences of such phenomena may hold some significance for economic and political developments in the archipelago, then the same may be true for the social and, perhaps, even the cultural development of communities exposed annually to repeated disasters.

The late Fr. Selga, who passed much of his long and distinguished career at the Manila Observatory collecting data on typhoons, published a particularly curious paper towards the end of his life describing a mass state of fear that he had observed on occasions in the Philippines and for which he coined the word *tifonitis*. He defines this condition as 'a pathological state owing to nervous over-stimulation produced by the frequency or extraordinary intensity of typhoons' and then proceeds to recount in great detail the events of mass-induced hysteria that followed the passing of five strong typhoons in quick succession between 15 October and 10 December 1934. It all began with a letter written by an old man in Mexico (Pampanga) during the first days of November that predicted a worse typhoon than the destructive one that had hit Manila the month before. This is then followed by reports from all over central Luzon and the Bicol region of farmers abandoning their fields, of neglected fish pens, of parents not sending children to school, of general apathy, lack of concentration and of a sweeping religious mania that the end of the world was at hand. Mass panic subsequently broke out among the fisherfolk and coastal dwellers around Manila as a rumour that two powerful typhoons from opposing paths would strike one another over the bay causing a devastating storm surge. The dread of typhoons apparently also extended to fear of other natural phenomena, especially of earthquakes and was most pronounced in the larger cities and among those already most severely affected by disaster as rumour fed on panic that, in turn, gave rise to more rumour.³⁵

For those who can expect to experience repeated disasters in both their personal lives and in the histories of their communities, the concept of hazard as a distinct phenomenon is often not a very meaningful one. There is no very clear separation between it, environmental degradation, poverty, marginalization,

³⁵ Selga 1935:54-8. Selga concludes with an account of an intriguing interview he had with 'one of the most typical cases of tifonitis' that had stretched his patience to the limits. A young man from Cavite had approached Malacañang claiming to have important information on typhoons and had naturally been referred on to the Observatory. The intelligence he subsequently imparted to the incredulous priest 'who would not have believed it if he had not seen it with his own eyes and heard it with his own ears' was the news that elders in the mountains of his province had old books that charted the phases of the moon and the position of the planets from which could be predicted the height of the tides, the state of the harvest, the scarcity or abundance of fish and the severity of storms for the next fifteen years. He had come to tell them that within five days a volcano would emerge from the depths of the sea off the Visayas and that many local steamboats would be sunk but that then the Philippines would be absolutely free of typhoons for the next five and a half years (Selga 1935:58).

disempowerment and disentitlement. As Arturo Escobar (1999:10) so forcefully reminds us, organic life originates and is maintained through a perpetual interchange with its environment: 'The formation of an organism and the environment are one and the same. People develop in a nexus of relations with the environment and with other persons'. Hazard is not an isolated event but is an integral feature of the very fabric of life for millions, if not billions of people. It is, in fact, a frequent life experience, the awareness of which is always present at a level just below that of consciousness and that can be summoned swiftly to the surface at the slightest provocation. And just as peasants may possess 'local models' of land, economy and production that are significantly different from modern ones and that exist chiefly only in practice (Gudeman and Rivera 1990:14), so there may be parallel schemas in which the concept of hazard only denotes a degree of risk within a continuum of those that beset everyday life and whose manifestations may baffle western social scientists determined to fit all human existence into a single uniform framework.³⁶ It is only through an appreciation of the past that anything approximating a true measure of the real impact hazards have played on societies such as the Philippines can be gauged. What is ultimately suggested is that societies here have come to terms with hazard in such a way that disasters are not regarded as abnormal situations but as quite the reverse, as a constant feature of life. This cultural adaptation whereby threat has become an integral part of the daily human experience, where it has become so 'normalized' in a sense, permits the historian of the Philippines to speak of societies that have evolved just as much in the shadow of the volcano as *bajo de campanas* (or literally 'under the bells').³⁷

³⁶ These ideas are more fully explored in Bankoff 2003, Chapter 8.

³⁷ The term commonly used to denote the inordinate influence of the clergy over Filipino society especially during the period of Spanish colonialism between 1565 and 1898. In particular, it refers to the policy of *reducción* whereby people were brought to live together in municipalities centred round the parish church.

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Box 7-16 'Dolo' de Samar.

Box 9-35 List of typhoons.

Box 10-37 Floods in the Philippines 1691-1911.

Box 13-8 Accounts of the eruption of various volcanoes.

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