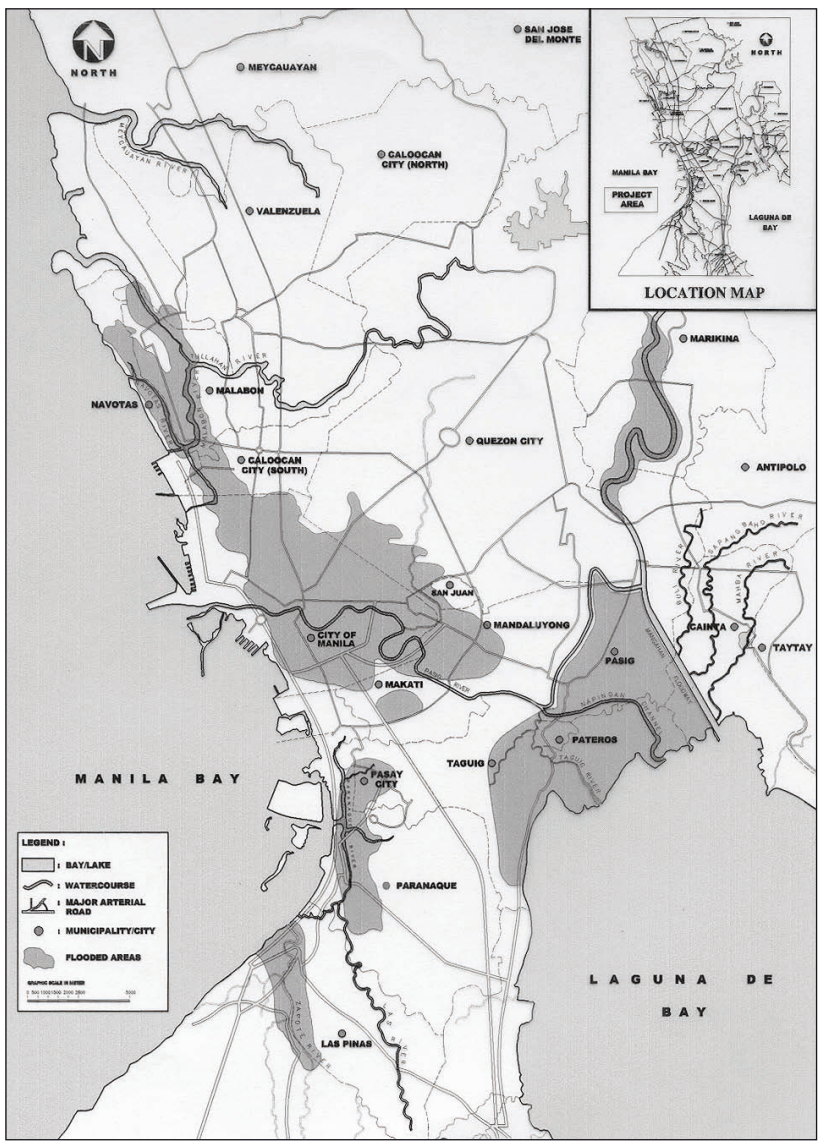
Vulnerability and Flooding in Metro Manila

Research > Southeast Asia

Rather than regarding floods as purely physical occurrences that require largely technological solutions, such events can also be viewed as the result of human actions. Critical to discerning the nature of flooding is an appreciation of the ways in which human systems place people at risk in relation to the environment and to each other, a causal relationship that is now mainly understood in terms of vulnerability. Only through a perspective that pays due attention to changes in topography, demographic growth, and urban development over time can the measure of flooding in Metro Manila truly be gauged. It is the interplay between three factors – history, nature, and society – that determines how the vulnerability of the city's inhabitants is constructed.



Metro Manila Development Authority

Flood prone areas in Metro Manila.

By Greg Bankoff

The National Capital Region (NCR) is situated in a semi-alluvial floodplain encompassing a land area of 636 square kilometres, open to Manila Bay on the west and to a large lake, Laguna de Bay, on the south-east. As such, it now constitutes a vast urbanized drainage basin that experiences frequent inundations from overflowing rivers and stormwaters, rendering the existing system of *esteros*, modified natural channels constructed during the colonial period, inadequate. Despite its vulnerability, however, rapid urbanization continues unabated. Solutions are difficult to realize as the metropolitan area is currently divided into twelve cities and five towns with a total population of 10,491,000 and a density of 16,495 persons per square kilometre.

Any appreciation of flooding in the metropolitan area first necessitates an understanding of the role the twenty or so typhoons that cross the Philippine 'Area of Responsibility' each year have on the archipelago's climate. The sudden and heavy rainfall that accompanies them is often associated with extensive flooding. While inundations affect all of the NCR, some areas are more vulnerable than others. About 20 per cent of the capital is designated as flood-prone, with areas to the east, south-east, and south, especially those adjacent to Laguna de Bay, acutely susceptible. In some particularly exposed cities such as Muntinlupa and Taguig, all *barangays* (the basic unit of local government) are regularly inundated and there is frequently a positive correlation between flood-prone areas and those cities and municipalities that have larger proportions of low-income residents.

Flooding has been a feature of daily life in Manila since at least the nineteenth century, but the first recorded instance of serious flooding dates to 1942. Major floods subsequently occurred in 1948, 1966, 1967, 1970, 1972, 1977, 1986, and 1988. The flooding caused by Typhoon Miding in 1986 inflicted the most serious damage in recent years, with floodwaters extending to over 16 per cent of the total area of Metro Manila. Matters have not improved much of late: thousands of Metro Manila residents were stranded on the streets or trapped in vehicles all night after heavy rains on 28 July 1995, and major flooding incidents happened again on 28 May 1996 and 18 August 1997. Over the past half-century, these floods have become both more extensive and more severe. Regularly inundated areas have spread from the low-lying coastal or riverine *barangays* to encompass the more suburban hinterland neighbourhoods, the newer urban developments, and the shores of Laguna de Bay. Moreover, water depths have also steadily risen, making flooding a major hazard and prompting a recent newspaper article to quip that: 'Though the deluge mentioned in the Bible may be argued as allegorical, the flooding that occurs in Metro Manila streets after a downpour is definitely not.'*

The extent of flooding has also been considerably aggravated in recent decades by land subsidence. Sediments that underlie river deltas have a high water content that is 'squeezed' by the weight of succeeding deposits, a process that is greatly accelerated when groundwater is extracted faster than it can be replenished by natural recharge from rain seeping back into the ground. Records taken at Manila's South Harbour show that mean sea levels rose about 2 millimetres a year between 1902 and 1960, but that the subsequent rate was about ten times faster. Such an increase cannot be explained as solely a consequence of global warming and bears a marked correlation to the rise in groundwater extraction. As the land around Manila Bay sinks and the level of the sea rises, flooding has become more prevalent not only in the city but also in the surrounding provinces.

These climatic and environmental factors interrelate in complex ways with the changes brought about as a result of human activities to make Metro Manila flood-prone. Principal among such developments is the size, density, and growth of the population. Since 1939, the number of people living in the metropolitan area has risen from 993,889 inhabitants to 10,491,000 (2000), an increase of over 10-fold. The sheer weight of numbers creates considerable pressure on resources and this, in turn, has substantial consequences on the environment and intensifies both the severity and duration of floods. Much of this population increase is attributable to massive urban migration since the Second World War, as rural folk are attracted to Manila by higher incomes and greater livelihood opportunities. Most of these people are poor and cannot afford the rapidly increasing costs of land, housing materials, and construction. As a consequence, most migrants have to find accommodation in the informal housing sector in neighbourhoods often situated on the urban fringes of cities.

In Metro Manila, the banks of rivers, canals, and *esteros* frequently serve in this capacity. The resultant makeshift housing often encroaches onto available waterways, blocking the access of maintenance personnel and equipment and, by a gradual process of accretion, narrowing their capacity to handle discharge. It is estimated that squatters along the banks of the metropolis' waterways now number some 164,000 people, though the urban poor are not the only ones responsible for such encroachments as governmental, commercial, and industrial concerns also play a significant role. Nor is construction the only environmental problem related to the gradual infilling of the *esteros*: Metro Manila inhabitants dispose of about 6,050 tons of garbage daily (1995), of which only 71 per cent is collected and taken to landfills. The remaining 1,750 or so tons are simply left on street corners, dumped on vacant lots, or thrown into waterways. Altogether, this represents an amount of from 55 to 157 tons of solid waste each day that clogs the network of drainage canals, poses a considerable risk to health, and greatly increases the likelihood of flood.

After the widespread inundations of 1972, a major flood mitigation programme was undertaken that resulted in the erection of the first seven pumping stations, two floodgates, and four drainage mains between 1974 and 1978. In 1980, excavation of the 10-kilometre long Mangahan Floodway diversion channel was begun, linking the Marikina River to Laguna de Bay so as to use the lake as a temporary catchment basin in times of intense rainfall. Subsequently, the flow of water out of Laguna de Bay has been regulated by the construction of locks (Napindan Hydraulic Control Structure) to control the reverse overflow into the lake through the reinforced channel of the Napindan River and alleviate flooding along its shoreline.

There are three aspects of flooding in Metro Manila that this brief overview illustrates: firstly, the importance of an historical approach in understanding how hazard is generated; secondly, the degree of interplay between environment and society in creating risk; and finally, the manner in which vulnerability is a complex construction. The notion that hazards are simply physical phenomena needs to be replaced by one that recognizes human agency as a major contributing factor. The root causes of vulnerability lie in a variety of relational exchanges; it is the dynamics between stakeholders (human agency and animal behaviour), the ecosystem (specifics of the environment), and nature (extreme physical phenomena) that determine the increasing complexity of such events. The construction of vulnerability to flood in Metro Manila, therefore, shows how societies and destructive agents are very much mutually constituted and embedded in natural and social systems as unfolding processes over time. <

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* Afuang, B., 'Floods and the City', *Philippine Star*, 15 (2001), p. 290 (16 May: B4)