Trčková, Dita

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5 Natural catastrophes

The present chapter starts with an explication of findings of anthropological, sociological and natural science studies on natural catastrophes. This is followed by the inclusion of background information on each catastrophe analyzed in the following chapters.

5.1 Unnatural aspects of natural catastrophes

Recent anthropological and sociological research on natural catastrophes reveals that natural disasters are complex phenomena resulting from an interaction between natural events and vulnerabilities of a society, determined by human contact with the environment, social organization, infrastructure and economy (Pielke and Pielke 1997; Birkmann 2006; Gunewardena 2008a; Schuller 2008). Natural catastrophes can thus be considered natural only in respect to being triggered by natural phenomena; they become disasters as a result of a combination of a number of factors including human behavior. As Kates (1980, quoted in Pielke and Pielke 1997, 38) states, "the impacts of natural events are joint outcomes of the state of nature and the nature of society."

Vulnerability is an essential concept that frames the problem of natural catastrophes. It can be defined as "the conditions determined by physical, social, economic and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards" (International Strategy for Disaster Reduction 2004, quoted in Birkmann 2006, 12). Such factors or processes include deforestation, a concentration of toxic substances, the number of exposed people living in disaster-prone areas, the quality of infrastructure and the level of adherence to building codes.

Importantly, since vulnerability is caused by humans, it can also be reduced through human agency. Preparedness, which subsumes a whole range of anticipatory and emergency management activities, such as mitigation, response and recovery, plays a key role in the reduction of vulnerability (Pielke and Pielke 1997). For instance, to minimize the number of exposed people and the amount of threatened property, "preparedness efforts such as insurance, evacuation, and building fortification" should be implemented (Pielke and Pielke 1997, 38). Preparedness involves both short-term actions, focusing on a particular approach-

ing disaster, and long-term actions, focusing on a disaster threat more generally (Pielke and Pielke 1997).

What follows from the definition of vulnerability is that disasters do not have an equal impact on all people, but differentiate along lines of class, race, age, gender and ethnicity (Gunewardena 2008a, 7). Those who are politically, economically and socially marginalized, such as the poor, elderly and ethnic minorities, are the worst-affected in natural catastrophes as they tend to have limited access to information about these events and lack the means, resources and capital to live somewhere else than in disaster-prone areas, to escape the catastrophe and to recover. As de Waal (2008, ix) summarizes, "power inequities are typically accentuated in all stages of disaster, from prevention and insurance, through protection and evacuation at the height of crisis, to relief and rehabilitation."

Sociological and anthropological research into natural catastrophes deconstructs the nature-culture dualism typical of Western Enlightenment thinking (Johns 1999, xviii). It reveals that nature cannot be viewed as isolated from society, and socio-economic processes and structures cannot be divorced from the natural world; there is no sharp boundary between nature and culture, but rather an interplay and interconnectedness.

5.2 The Indian Ocean tsunami

The Indian Ocean tsunami formed on December 26, 2004 as a result of a Sumatra earthquake with a magnitude 9.15 on the 1-to-10 Richter scale. It travelled 4,500 kilometers across the Indian Ocean and affected twelve countries within about seven hours. About 250,000 people were killed and around 1.7 million more were displaced in the disaster. Indonesia was the worst hit country, with more than 80,000 dead and 100,000 injured, followed by Sri Lanka with almost 30,000 deaths, India about 15,000, and then Thailand, East Africa, Malaysia, the Maldives, Burma, and Bangladesh. The tsunami also affected foreign tourists, killing more than 2,000. It destroyed houses, marketplaces, commercial, public and municipal buildings, and transportation networks, with the economic impact estimated to be in the billions of dollars (Rodriguez et al. 2006; Gunewardena 2008b; Fuller 2010).

The damage was not caused only by the natural phenomenon but was compounded by human-made aspects. As Niman (2010, 94) reveals, one of them was a destruction of protective environmental features. Historically, the low-lying areas across the Indian Ocean have been protected by coral reefs tempering waves, and mangrove swamps, which diminish tsunami forces. However, these have been destroyed by irresponsible human actions connected with shoreline development, such as the use of pesticides, coral mining, dynamiting and mangrove logging.

Furthermore, social, political and economic conditions determined the vulnerability of people to the tsunami, with the poor, the marginalized and the disempowered being affected more than the rest of a population (Gamburd and McGilvray 2010, 6). Drawing upon work of other researchers, Gamburd and McGilvray (2010, 6) reveal that in Somalia the situation was worsened by an existing humanitarian crisis, and in India many more women than men died and members of certain castes suffered more and received less aid than others.

In Sri Lanka, the majority of fatalities and the worst affected by the tsunami were the low-income fishermen families living along the coastline. Their settlements lacked safe water, sanitation systems and proper local infrastructure (Gunewardena 2008b; Frerks 2010). Frerks (2010, 150) reveals that "80 percent of the affected households lived on less than one dollar per day/per person before the tsunami struck." At the same time, women were hit harder by the catastrophe than men, especially because of embedded gendered cultural norms and behaviors. The vulnerability of people to the tsunami in Sri Lanka was also aggregated by an over twenty-year-long civil war between the Tamil people and the Sinhalese government. The war had worsened economic and social conditions of the populations, making them particularly sensitive to the impact of the disaster (Frerks 2010; Soysa 2010; Keenan 2010). The catastrophe that occurred in Sri Lanka was therefore an intersection of a tsunami, a civil war and generally poor living conditions.

The initial response of Sri Lanka's government was slow and often ineffective since it was overwhelmed by the situation, lacked resources, and was hindered by its accountability structures and rules. Moreover, the government tended to operate through patronage politics with individuals acting for their own benefit, which resulted in the distribution of resources being determined by ethnic, regional and caste differences (Frerks 2010).

The consequences of the tsunami could have been mitigated if a warning system had existed in the Indian Ocean, as it does in the Pacific Ocean. While earthquakes cannot be predicted, it is possible to give about a three-hour notice of a tsunami unleashed by an earthquake, which would have saved many lives on December 26, 2004 (Gunewardena 2008b, 76). It was not only the lack of a warning system but also the failure of scientific communication that contributed to the disaster. As Dickson (2010) points out, seismologists in many countries all over the world, such as Australia and California, detected the earthquake and were aware that it would result in a massive tsunami. Yet, without the existence of direct channels of communication, the information was not spread to the communities under threat. Apart from the lack of technology, there was a lack of adequate disaster preparation and mitigation efforts across the Indian Ocean. Rodriguez et al. (2006) reveal that public awareness and knowledge, and public alertness of a tsunami hazard were almost absent in the countries threatened by the tsunami.

5.3 Hurricane Katrina

Hurricane Katrina made landfall in New Orleans on August 29, 2005; yet, the landfall itself did not cause much damage. It was the following breaches to New Orleans' levees that led to the catastrophe. Throughout August 29 and 30, levee breaches resulted in the flooding of 80 percent of the city, the loss of more than 1,500 lives, damage to 183,000 housing units, and an around $200 billion in economic damage. Although most New Orleans inhabitants obeyed the mandatory evacuation order issued by Mayor Ray Nagin and left New Orleans ahead of the storm, tens of thousands of residents stayed stranded in the city, with around 20,000 in the Superdome sports center, 20,000 in the city's convention center, and others in their homes (Fitzpatrick 2006; Sanyika 2009).

An investigation following Hurricane Katrina revealed that it was not only the failure of the levee system that led to the damage and destruction but also the failure of local, state and federal governments (Cooper and Block 2006; Greene 2009; Waterhouse 2009). Greene (2009, 208) reveals that "the Committee on Homeland Security observed that government officials failed to heed disaster warnings, made poor decisions before and after the hurricane hit, failed to provide effective leadership, and failed to develop the capacity to respond to catastrophic events." Government and bureaucracy failed both in the preparation for and response to the natural catastrophe.

Scientists, meteorologists and government officials had been aware for years that a devastating hurricane of Category 5 (a label given to winds greater than 155 mph, based on the hurricane rating system the Saffir-Simpson scale (Longshore 2008: 364)) might strike New Orleans. The city had carried out a simulation of such a hurricane, named PAM, in which it was estimated that around 130,000 Orleanians might be unable to evacuate the city. Multiple investigations had also revealed that if such a hurricane occurred, the levee system might be overwhelmed. Yet, in spite of all the predictions, the government was not prepared for Hurricane Katrina and the mass evacuation and starvation connected with it (Sanyika 2009; Greene 2009; Nunn 2009).

The response of the government to the disaster was immensely slow (Cooper and Block 2006; Sanyika 2009). For four days, thousands of people were trapped in the Superdome, the convention center, or their homes, without food, water, sanitation and medical care. What exactly stood behind the slow response of the government has been debated ever since; it was rather a combination of factors that led to the failure. One of the factors was the lack of cooperation between the local, state and federal government, with each of them conducting an independent operation. Another factor is that FEMA constituted a part of the Department of Homeland Security with a "top-down, command-and-control model of an agency" (Perrow 2007, 18), which made it difficult for FEMA to "call the shots

from the ground of a disaster, and [...] tell whether the supplies it had ordered were in fact on the way" (Cooper and Black 2006, 187). Many government officials were on vacation at the time of Katrina's landfall, which did not help a smooth response either. On the whole, the devastation was worsened by organizational failure, government incompetence and a bumbling bureaucracy (Cooper and Black 2006; Sanyika 2009).

As happens in most natural catastrophes, Hurricane Katrina revealed the problematic social, economic and political conditions existing in New Orleans. The image of New Orleans as the Big Easy, a place to relax and enjoy good food and cultural life, was undermined by the disaster. Katrina exposed racial, class and gender inequalities that had troubled New Orleans for years. At the time of the disaster, the city "claimed the second highest percentage of its residents (38 percent) living in high-poverty census tracts" and belonged among the most racially-segregated U.S. cities, with the black poverty rate (35 percent) three times higher than the rate for whites (11 percent) (Levitt and Whitaker 2009, 6). This was a result not only of individual choices but also of a long history of social and institutional structures existing in New Orleans (Jones-Deweever and Hartmann 2006; Reed Jr. 2008; Levitt and Whitaker 2009; Sanyika 2009).

The worst affected by the natural disaster were the marginalized: the poor, the black, the old and women. They represented the most vulnerable residents, the have-nots, who were fully exposed to the catastrophe as they did not have the means to escape or live anywhere else than in the inner city where the worst flooding occurred. Thus, the inequalities and disparities of New Orleanian society was reflected in the unequal impact of the disaster, which, although named Hurricane Katrina, was to a large extent human-made (Jones-Deweever and Hartmann 2006; Levitt and Whitaker 2009).

5.4 The Haiti earthquake

An earthquake struck Haiti on January 12, 2010. It measured 7.0 on the Richter scale and its epicenter was about 17 kilometers southwest of Haiti's capital, Port-au-Prince. Approximately 230,000 people were killed, more than 300,000 injured and more than 1.3 million were rendered homeless in the disaster. More than 250,000 homes and 35,000 commercial, industrial, and administrative buildings were destroyed. The value of damage is estimated between 7 and 14 billion U.S. dollars (Arbon 2010; Dupuy 2010).

The impact of the disaster was exacerbated by man-made factors. These include poor infrastructure, inferior building constructions and an abandonment of citizens by the city and national governments, which for years had not provided any meaningful services, such as schools, health care, electricity, potable water and

sanitation, and what they had provided was aimed at the wealthy. Only about 30 percent of Haitians had access to health care, the same percentage to sanitation and 54 percent to potable water. The low socio-economic resources in Haiti and a massive institutional failure (which predated the earthquake) to a large extent contributed to the catastrophe (Dupuy 2010; Gros 2011).

It is not only the state itself that was responsible for the unfortunate living conditions in Haiti, but also foreign governments and economic actors. The policies of international financial institutions of advanced countries, such as the World Bank and the International Monetary Fund, led to the transformation of Haiti into "a supplier of the cheapest labor in this hemisphere for foreign and domestic investors in the export assembly industry and one of the largest importers of U.S. food in the hemisphere" (Dupuy 2010, 196). The location of the assembly lines mainly in Port-au-Prince prompted residents from the rural areas to migrate to the capital city, which contributed to its highly dense population. Trade liberalization, one of the main policies that Haitians were made to implement, resulted in the destruction of local industries and a neglect of agriculture, further propelling rural-to-urban migration (Dupuy 2010; Gros 2011).

Although earthquakes cannot be predicted, they can be prepared for. The Haitian government had been warned of the possibility of an earthquake for years; yet, no mitigation and preparedness efforts had been implemented (Dupuy 2010).

5.5 The Tōhoku earthquake and tsunami

The Tōhoku earthquake of magnitude of 9.0 with an epicenter 129 kilometers east of Sendai struck the northeast coast of Japan on 11 March 2011. It belongs among the five most powerful earthquakes that have ever been recorded. Yet, more damage was caused by the tsunami, 15–20 meters high, that was triggered by the earthquake and that affected over 2,100 kilometers of the eastern Japanese coastline. More than 15,000 people were killed, more than 10,000 people were injured and missing and around 500,000 people had to be evacuated. Most of the victims were the elderly, who represented around one-third of the population in some of the affected areas and who were made vulnerable due to their inability to move freely. The catastrophe resulted in a complete destruction of more than 114,000 houses, and the total damage was estimated at more than 235 billion U.S. dollars, making it one of the most costly natural disasters ever (Davis et al. 2012; Korkietpitak 2013; Tanaka et al. 2013).

The natural catastrophe triggered the worst nuclear disaster since Chernobyl in 1986. It occurred at the Fukushima Daiichi power plant, which the earthquake cut off from the external power source and where the tsunami destroyed the back-up electricity system, the function of which is to serve as a source of power for pumps

cooling fuel rods. As a result, a meltdown occurred at three units at the plant, with a high amount of radioactivity being released into the environment. More than 200,000 people had to be evacuated from areas near the plant, and the nearby land and groundwater was contaminated. As the long-term effects of exposure to low level radiation are not precisely known, the predictions of a number of potential deaths from cancer-related diseases vary from 130 to 1,000. Due to the location of the power plant near the Pacific Ocean and the wind mostly flowing towards the ocean, more than 80 percent of the radioactivity flowed into the sea, and thus the amount of affected Japanese was relatively low (Wang et al. 2013; Koo et al. 2014; Rangel and Lévêque 2014).

Davis et al. (2012, 17) reveal that the Tōhoku earthquake "was detected years ago using a combined earthquake prediction algorithm called M8-MSc." It was predicted that there was a 70 percent chance of an earthquake of magnitude 8.0 or bigger to strike between mid-2001 and mid-2011. Yet, as the authors state, the predictions were not used to improve preparations that could have prevented the Fukushima nuclear power plant meltdowns and reduced the damage from the earthquake. Adequate preparation measures based on the predictions were not implemented for two reasons: insufficient communication and cooperation between earthquake predictors, emergency managers and policy makers, and an insufficient application of existing methodologies concerning intermediate-term earthquake prediction in decision-making processes (Davis et al. 2012).

Furthermore, Wang et al.'s (2013) analysis of archival materials on the development of the tsunami design at the Fukushima power plant showed that TEPCO (Tokyo Electric Power Company), the operator of the plant, and nuclear regulators in Japan had ignored warnings about tsunami risk from the government and had not upgraded safety counter-measures against such a natural catastrophe prior the Tōhoku disaster. Moreover, the authors point out that there was a fourteen-hour delay in injection of seawater into the reactors once the source of power for the pumps was cut off, while an immediate action was necessary. On the whole, it is likely that if the right actions had been taken, the Fukushima nuclear disaster could have been prevented.

5.6 Summary

The present chapter reveals that the consequences of all four disasters were magnified by man-made factors. This was the case not only of developing countries, where poor political and socio-economic conditions, including poor infrastructure and building conditions, prevail, but also of developed, wealthy countries – Japan, which is known for an implementation of strict building codes due to a frequent occurrence of earthquakes, and the United States. In both of these de-

veloped countries, inadequate and insufficient prevention measures were implemented prior the disaster even though in both cases a natural disaster of a similar magnitude had been predicted in advance using scientific methods.

The worst affected people in all the four disasters were social minorities. In the case of the Indian Ocean tsunami, it was the poor, women and members of low social casts who were most severely affected. Similarly in New Orleans, apart from the poor and women, the black and the elderly were the most vulnerable. Identically, in Haiti the poor and marginalized were impacted the worst, and in Japan most of the victims were the elderly.