

A case study of a multi-hazardous environment: Haiti

3.1.5.7 Hazards

What you need to know

Case study of a multi-hazardous environment to illustrate and analyse the nature of the hazards and the social, economic and environmental risks presented.

Case study of a multi-hazardous environment to illustrate how human qualities and responses such as resilience, adaptation, mitigation and management contribute to its continuing human occupation.

Multi-hazardous environments worldwide

Between 1994 and 2013, EM-DAT (the International Disaster Database) recorded 6,873 natural disasters worldwide, which claimed 1.35 million lives and affected around 218 million people every year during this 20-year period. A majority of these deaths occurred in disaster hotspots or countries at extreme risk from at least two hazards. According to EM-DAT, places with the highest occurrence of natural disasters were in the eastern part of the USA (Missouri, Texas, Oklahoma, Illinois, New York, Pennsylvania, Kansas) and the southern part of China (Guangdong, Sichuan and Guizhou).

According to the World Bank's Natural Disaster Hotspot study, the countries at relatively high mortality risk from multiple hazards include Bangladesh, Nepal, the Dominican Republic and Haiti. All of the places named suffer from more than one type of natural disaster. Most are located near plate boundaries, near large rivers or the coast and experience tropical storms.

Haiti

The Caribbean island of Haiti, located on the island of Hispaniola is a disaster hotspot. The island is relatively small, with a population of 10.6 million. Haiti is situated in a seismically active zone, intersected by two fault lines on a conservative margin and lies in an active hurricane region. 60 per cent of Haiti is mountainous and due to deforestation, landslides and mudslides are common. Deforestation has been rapid over the last fifty years and is a result of Haitians cutting trees down to use as fuelwood and charcoal for cooking. Due to its high level of socio-economic, environmental and political vulnerability, Haiti struggles to cope in most disaster situations.

Year	Disaster type	Death Toll	Total affected
23.05.2004	Flood	2665	25 000
17.09.2004	Storm (Jeanne)	2754	80 000
28.10.2007	Storm (Noel)	90	108 763
26.08.2008	Storm (Gustav)	85	865 000
02.09.2008	Storm (Hanna)	529	865 000
06.09.2008	Storm (Ike)	74	865 000
12.01.2010	Earthquake	222 570	3 700 000
22.10.2010	Epidemic	7128	513 997
24.10.2012	Storm	75	201 850
01.01.2014	Drought	0	1 000 000
01.01.2015	Epidemic	40	800 000

Disasters in Haiti 2004-2015 (EM-DAT data, 2016)

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Haiti is the least developed country in the western hemisphere, with a GDP of £1,300. The people of Haiti are particularly vulnerable to hazards as they mostly live in poor-quality housing, with high levels of poverty (77 per cent living on less than US\$2 a day) and are concentrated on the flood-prone coastal areas (at population densities of up to 40 000 km² in Port-au-Prince). Additionally, Haiti suffers from political instability that further increases its vulnerability to disasters, unable to effectively prepare for disasters.

Disaster risk

Risk is the potential disaster losses and can be shown in the disaster risk equation:

$$\text{Risk (R)} = \frac{\text{Hazards} \times \text{Vulnerability}}{\text{Capacity to cope}}$$

Capacity to cope can be improved by disaster mitigation, planning and preparation actions. The risk of disaster grows as global hazards and people's vulnerability increases, while their capacity to cope decreases.

There are four types of vulnerability:

1. **Physical Vulnerability** links to population density levels, remoteness and quality of housing.
2. **Social Vulnerability** refers to the inability of people, organizations and societies to organise to cope with adverse impacts to hazards e.g. governance, social equity.
3. **Economic Vulnerability** links to the economic status of individuals, communities and nations. The poor can be more vulnerable to disasters because they lack the resources to protect themselves from disasters.
4. **Environmental Vulnerability** refers to natural resource depletion and resource degradation.



Atlantic hurricane season 2008 (NASA/National Hurricane Center [public domain](#))

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The nature of Haiti's hazards - social, economic and environmental risks

In recent years, Haiti has experienced severe economic losses due to disasters. The country is situated in the predominant Atlantic hurricane path and is frequently hit by four or five storms between June and November each year. Haiti had suffered nine serious storms over the previous 20 years affecting 3.5 million people and killing over 7 000.

In 2008, Haiti experienced a particularly severe hurricane season when it was hit by Tropical Storm Fay and Hurricanes Gustav, Hannah and Ike (FGHI) over a three-week period. As a result of flooding, hurricane-force winds, mudslides and coastal surges there were 793 deaths, 25 000 homes destroyed and economic damages of US\$1bn (equivalent to five per cent of the country's GDP). In total, 825 000 people were affected, particularly those living in the fourth largest city, Gonaives. Floods wiped out 70 per cent of Haiti's crops, resulting in dozens of deaths due to malnutrition in the following months. The floods were particularly destructive as the soil that was once held in place by tree roots, were eroded by heavy rainfall following deforestation.

Haiti is located on the plate margin where the North American Plate is sliding past the Caribbean Plate. Both plates move in the same direction, but one moves faster than the other. The pressure built up between the two plates was eventually released causing a magnitude-7 earthquake on 12 January 2010 with an epicentre 25 km west of the capital, Port-au-Prince. Most of the damage occurred in the capital, due to the shallow focus (13 km), strength of shaking, high population density and poor-quality of housing. The massive earthquake, the biggest the region had seen in 200 years killed 222 570 people and 300 000 more were injured, mostly by falling rubble. Over 30 000 commercial buildings collapsed, so too did hospitals, schools and thousands of homes.

Two million people were displaced; many ended up living in social and economic situations worse than before the earthquake. Some survivors moved away from the capital to housing projects such as Village Solidarité, seeking a better life away from the squalor and crime in Port-au-Prince. Ten months after the earthquake cholera quickly spread along the Artibonite River, killing 9 000 people and infecting an estimated 21 000 in 2010 alone. It is thought the disease was introduced by infected UN troops dispatched to the country to assist in disaster-relief efforts, spreading quickly through unsanitary refugee camps.

Resilience, adaptation, mitigation and management

Before the earthquake, the people of Haiti were already vulnerable to disasters due to systemic poverty, fragile governance, insecurity and a continual threat of natural disasters. The Haitian government had taken some actions to improve disaster preparedness and response. In 2001, the National Disaster Risk Management System (NDRMS) was set up to transition from a 'living at risk' to 'living with risk' approach to natural hazards.

Disaster risk reduction is also a priority of the United Nations Development Assistance Framework, as well as the World Bank's Country Assistance strategy as it is believed

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to be a critical component of a country's poverty reduction and economic growth strategy. While the 2004 hurricane season saw 5 000 casualties and 300 000 affected people, FGH1 resulted fewer than 800 casualties even though 865 000 people were affected.

The NDRMS has already worked towards the following:

- A national natural hazard and disaster vulnerability map, completed in association with Oxfam can help disaster planning and preparation activities.
- The development of an Emergency Operations Centre where civil servants can manage disasters.
- Expanding the number of weather-monitoring stations across the island so that the National Meteorological Center (NMC) can supplement data provided by the United States' National Oceanic and Atmospheric Administration' (NOAA) National Weather Service forecasts. Forecasting can provide vital time for people to prepare or evacuate before storms or flooding occurs.

Following the 2010 earthquake, the NDRMS Emergency Operations Centre, Port au Prince's main fire station and many government buildings were all badly damaged or destroyed. This meant that the emergency crews and civil servants that should lead and manage the response to the earthquake were, unfortunately, themselves victims. This meant that an international emergency response was needed. Humanitarian responses in the first six months included:

- Four million people received food aid
- 1.2 million had access to safe water daily
- 1.5 million people received emergency shelter materials
- 2.1 million household non food item kits were distributed
- 11 000 latrines were installed
- 90 per cent of displaced people in Port-au-Prince had access to health clinics
- 195 000 children benefited from temporary learning spaces
- 550 000 children and women with babies received supplementary feeding
- 5 900 people relocated from imminently dangerous locations
- 142 000 people received agricultural inputs for spring planting

(Information from the OECD report '[Evaluation Insights](#)')

There were difficulties trying to import aid after the earthquake due to the collapse of the control tower at the airport. Oxfam's local supply warehouse was also destroyed. This meant vital emergency aid supplies were slow to arrive. Mobile data revealed that around 630 000 persons present in Port-au-Prince on the day of the earthquake had left the capital 19 days post-earthquake. Mobile-phone data was also used to pinpoint where aid was needed in the days after the quake. FrontlineSMS pulled together a team of 1,000 Creole-speaking volunteers to log and geo-tag some 80 000 text messages, in order to provide crisis mapping and actionable information for the aid organisations.

The UK public donated £107 million; this was the second highest total for any DEC appeal after the 2004 tsunami appeal. The EU gave £250 million in aid and the World Bank waived the countries debt repayments for five years. Haiti's neighbour, the

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Dominican Republic sent teams to deliver food and medicine and assess the damage, it also eased visa requirements to allow the injured into Dominican hospitals and accepted relief shipments, that could be transported by land to Haiti.

The United Nations was able to support the recycling of 20 per cent of removed earthquake debris, provide jobs to more than 300 000 people and provide training for more than 270 000 employees in development and recovery-related fields.

Conclusion

Looking forwards, initiatives such as the Communicating with Disaster-Affected Communities (CDAC) project and Thomson Reuters Foundation's new Emergency Information Service (EIS) are now in place to establish two-way communication between humanitarian actors and the Haitian people. This should help to improve disaster responses in the future. Unfortunately, many of the people in Haiti still do not have resilience or the capacity to recover quickly from the effects of natural hazards. They are also more vulnerable to future disasters, living in worse conditions now than before the 2010 earthquake. Without a stable government and massive investment in infrastructure, buildings and community facilities, conditions in Haiti are unlikely to improve.

In the future, warmer ocean temperatures caused by climate change, may fuel stronger hurricanes. This increase in hazard magnitude could increase hazard risk and cause problems for the people of Haiti. It is a concern due to their low resilience, lack of savings or financial re-building capacity, poor organisational capacity to cope and high vulnerability.