Not the earthquake's fault

To the Editor — The disaster that befell Haiti on 12 January 2010 was fundamentally caused by 300 years of poor governance, foreign debt and land degradation that had made the population vulnerable to natural hazards. The M_w 7.0 earthquake was only the trigger. As pointed out in the *Nature Geoscience* focus issue dedicated to the earthquake[1], Haiti's future relies on delineating the imposing seismic hazards in the region. Yet to preclude future disasters of this magnitude, the ecohistorical roots of the society's present environmental condition must be taken into account.

Haiti's vulnerability to natural hazards is intimately linked to the overexploitation of its originally rich natural resources. Haiti has not always been the poorest country in the Western Hemisphere. In the mid-eighteenth century, the colony accounted for more than one third of France's gross domestic product. But this bounty came at a price. Writing in 1808, Martinican polymath Médéric Louis Élie Moureau de Saint-Méry commented on the state of Haiti's environment[2]:

"…[The colonists] have cut down even the trees that covered the summits of the mountains and attracted the rains, insomuch that a diminution of the rains is now perceivable in the French part, where they were formerly very considerable and regular…"

As well as environmental degradation, slavery — another legacy from the colonial period — added to Haiti's vulnerability. At its peak, up to 40,000 slaves per year were brought in to fuel growth of agricultural production, making it one of the most densely populated colonies in the region. Slaves dramatically outnumbered their keepers who relied on means of control so brutal that up to 30% of the slave population died every year[3]. Eventually, a revolt led to Haiti's independence in 1804, and it became the first black nation in the Caribbean.

Three critical factors in Haiti's early years contributed to the present vulnerability. First, the newly liberated farmers abandoned the plantation model. Large landholdings were divided, with each division run by an individual family. Land fragmentation was exacerbated by customary land inheritance laws, still in place today. This limited agricultural productivity, and the lack of a collective resource management strategy, led to further land degradation and deforestation[4]. Second, Haiti was ostracized by would-be trading partners that held slaves themselves: were Haiti to succeed economically, it might inspire revolts elsewhere, they feared. Third, France fined the new nation a staggering 150 million francs (worth US$22 billion today) as indemnity to the dispossessed colonists. Servicing this debt throughout the twentieth century impeded the government's ability to invest in infrastructure, health care and education improvements[5].

BRIAN G. MCADOO

Figure 1 | Agriculture, poverty, erosion and deforestation converge at Furcy, in the hills above Port-au-Prince, Haiti. Wood chips are carefully harvested from this tree for cooking fuel, keeping it alive to maintain erosion control.

Hardwood forests were harvested and exported to generate income. Without trees, the erosion of the nutrient-rich soil and coastal sedimentation accelerated throughout the twentieth century. This coastal progradation averaged around 3 m yr^{-1} over the past 30 years[6], although rates are not constant.

Between 1978 and 1986, the coast prograded by around 8 m yr^{-1}. During this period, Haiti's gross domestic product dropped: the tourism industry was decimated by the AIDS crisis; the rural economy suffered with the US-led eradication of the Creole pig (a hardy, locally adapted breed of pig that was replaced by more vulnerable breeds in response to fears of a swine flu epidemic); and there was an exodus of Haiti's professional class under the regime of Jean-Claude ('Baby Doc') Duvalier.

Increasing rural poverty led to deforestation, through efforts to gather fuel and clear farmland, and eventually to more erosion and coastal sedimentation. As the economy stabilized during the transition to democracy between 1986 and 2005, coastal progradation slowed, to 2.5 m yr^{-1} between 2005 and the present day. However, rural poverty remains high and the exodus from the countryside to the cities continues.

The devastating inland conditions make the Haitian coastal population vulnerable. Excess coastal sedimentation led to tsunamigenic landslides triggered by the earthquake[6]. Erosion

directly related to deforestation and poverty creates accumulations of poorly consolidated coastal sediment, with elevated fluid pressures that make seismically induced landslides inevitable: the Haitian tsunamis of 10 January 2010 were anthropogenic.

Three hundred years of complex interactions in Haiti between humans and their environment culminated in a disaster of unprecedented magnitude. Earth scientists are needed to determine the frequency and magnitude of the causative hazards, yet interactions with anthropogenic factors must be considered in complex disasters. Seismometers, palaeoseismic reconstructions and effective building codes are essential to reducing future risks. However, socioeconomic and environmental vulnerabilities must be factored in, to provide the best data for effective disaster risk reduction[7]. ❐

References

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Brian G. McAdoo[1]* and Lisabeth Paravisini-Gebert[2]

[1]Department of Earth Sciences and Geography, Vassar College, Poughkeepsie, New York 12601, USA, [2]Department of Hispanic Studies, Vassar College, Poughkeepsie, New York 12601, USA.

*e-mail: brmcadoo@vassar.edu

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Correction

In the Correspondence 'Not the earthquake's fault' (*Nature Geosci.* doi:10.1038/ngeo1116; 2011), 'cooking oil' should have read 'cooking fuel' in the caption for Figure 1. This error has been corrected for all versions on 17 March 2011.