Educational hazards? The politics of disaster risk education in Rio de Janeiro

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Disaster education outcomes are highly dependent on the political context of that education. Based on a rich, in-depth case study of the creation of community monitors in a landslide and flood-prone city in southeast Brazil, this paper demonstrates how developmental and political environments add much additional nuance to existing theories of behaviourist and transformative education for disaster preparedness and mitigation. Beyond identifying the benefits of education, it argues that disaster risk reduction outcomes are reliant on governance frameworks that alter over time. The study reveals the political complexity associated with programme implementation and cites the perspectives of a number of participants. Disaster education is shown to be the necessary yet underappreciated twin of the militarised and technical approaches that dominate disaster response in Brazil. Understated, however, is education's situatedness: how it can become an arena of conflict between government and civil actors over matters of state and society in increasingly hazardous urbanisation settings in Latin America.

Keywords: Brazil, critical pedagogy, disaster risk education, environmental policy, risk communication, urban development

Introduction

This paper reports on an in-depth case study of a youth education programme aimed at public mobilisation vis-à-vis disaster risk in a peripheral district of Nova Friburgo, a city of some 170,000 people in the state of Rio de Janeiro, Brazil. Approximately 1,000 people died in floods and landslides in the region following a heavy storm in January 2011, with one-half of those casualties in Nova Friburgo. The 'Mãos à Obra' education programme (discussed in detail later) was implemented in the Córrego d'Antas neighbourhood to the northwest of the city from 2012–14. The analysis is underpinned by the author's research on the urban risk politics of Nova Friburgo completed in that period, but it draws primarily on a series of more recent interviews conducted in late 2017 with the participants and initiators of Mãos à Obra. The primary goal was to understand, given the dominant focus on containment engineering, how such a programme emerged and what its achievements were in the longer term.

Mãos à Obra is an interesting case for disaster risk reduction (DRR) scholars in general, and education analysts in particular, as it points up how such programmes are guided by questions of political power across scales rather than (solely) by educational theory. The paper shows how politicisation influences not only how such initiatives and syllabi are created and delivered, but also *who* participates in them and

in what way. Disaster education traditionally falls into two, albeit overlapping, categories. The first approach is 'behaviourism', which centres on communicating the dangers of objective or external natural hazards, with a view to nudging exposed populations towards enhancing their preparedness. The second approach is 'transformative', which concentrates on locating the cause of a disaster in socio-environmental vulnerability, and thus aims to educate for reasons of political empowerment and societal transformation. These two positions are well explored in the literature (see, for example, Wisner, 2006; Shiwaku and Shaw, 2008; Heijmans, 2009; Wisner et al., 2018). Nonetheless, the political-institutional contexts that enable the delivery of disaster education, including conflicts and compromises *between* behaviourist and transformative content, remain underexplored.

Disaster risk is not a new phenomenon in Nova Friburgo. Originally a nineteenth century colony in the Atlantic Forest located 130 kilometres from the city of Rio de Janeiro, its development entailed extensive settlement on mountain slopes and along interlinked valley floors, especially after industrialisation and its rise as a centre of metalwork and textile production (Araújo and Mayer, 2003). The conversion of forested mountainsides into housing sites, and above them, cattle pasture and eucalyptus plantations, led to gradually worsening erosion, landslides, and floods throughout the twentieth century (Nehren et al., 2013; Bustillos Ardaya, Evers, and Ribbe, 2017; Coates, 2019). Since the 1970s, housing subdivision developers with local political connections have driven rapid peri-urban expansion into hazardous areas; a process that provokes continuing calls for better DRR, just as disaster risk *creation* is usually ignored (*cf.* Lewis and Kelman, 2012). While changing the behaviour of vulnerable populations with respect to 'external' hazards can no doubt save lives at specific times, ongoing hazardous development makes behaviourist approaches to education highly problematic, as they tend to ignore the underlying causes of risk. Nonetheless, this paper demonstrates that while Mãos à Obra had clear social-transformative intentions, its initiators at the Rio de Janeiro state level were also guided by their own biases, and the programme's actual implementation required alliances and compromises with developmentalist actors across political scale. Away from 'ideal' theories of disaster education, it necessitated in practice engagement with people beyond vulnerable residents, notably municipal politicians, developers, and those at higher levels of government and within non-governmental organisations (NGOs). The gap between behavioural change and transformation was narrow because agreement could not be reached on the causes of disaster.

This research draws on approaches from urban political ecology (Rademacher, 2015) and the extended-case ethnographic method (Burawoy, 2009). It sought to identify the experiences of those most exposed to socio-environmental hazards, and their meaning, as well as those delivering projects (infrastructural ones in particular) designed to address that exposure, often farther afield from the immediate study site. Eighty semi-structured interviews were conducted from 2012–14, and the author observed three Mãos à Obra sessions in a local school between May and August 2013. That background frames knowledge of the case, but eight follow-up interviews in

December 2017 represent the core content of the study. The goal was to pinpoint what conditions had made Mãos à Obra possible, as well as to garner its participants' retrospective thoughts on the accomplishments and limitations of the programme.

The author conducted the interviews and did the translations from Portuguese, and, in accordance with ethnographic conventions, anonymised the names of the respondents. The interviewees, although providing criticisms, were broadly enthusiastic about Mãos à Obra. Significant effort was invested in meeting with two individuals who were less committed to the programme—and whose perspectives may differ from those presented here—but unfortunately they were unwilling to contribute to the study. In spite of this disappointment, the pool of knowledge and the presentation of the wider case means that it does not compromise the findings in any way.

The next section reviews the relevant literature on preparedness, risk communication, and transformative education. Particular emphasis is put on the politics of disaster and problems in implementing progressive education initiatives in the existing state–developmental context of Brazil. The following four sections describe and analyse the implementation of Mãos à Obra, drawing on personal observations and extensive quotes. Areas in which the programme might be seen as successful are charted, the politicised setting is highlighted—which eventually led to its abrupt end —and the ambivalent reflections of those involved in 2017 are set out. The paper concludes with a discussion of the consequences of the politics of education for DRR and an assessment of the importance of avoiding 'zero-sum' assertions of its achievements without situated analysis of the causes of disaster in rapidly urbanising environments. Far from rejecting the important role of education in social development and risk reduction, the paper calls for political nuance across scales that can better inform its limitations and successes.

The politics of disaster education

As noted, theories of education for the purpose of DRR traditionally fall into two overlapping categories. A 'behaviourist' approach—focused on how people interpret, react to, and modify their attitudes to objective, existential, hazards—underscores the benefits of pragmatic risk communication in reducing loss of life and livelihoods (*cf.* Rohrman, 1998; Slovic and Weber, 2002; Shiwaku and Shaw, 2008). A 'transformative' approach, inspired by Freirean critical pedagogy,[1] instead views disaster as socially constructed, and argues for the empowerment of the poor and marginalised to tackle developmental and political vulnerability and to drive forward social change (Freire, 1996; Maskrey, 1989; Wisner, 2006; Heijmans, 2009). This section not only spotlights the differences and points of convergence between these two positions, but also assesses why competing political pressures in specific local realities can restrict in practice the scope of either behaviourist or transformative education for DRR. It goes on to set out the relevant theory for the in–depth case study that follows.

The 'strength' of a community, sometimes perceived according to its level of social capital, is frequently held up as the key to timely rescue and to adequate recovery and

rebuilding in a disaster situation (Nakagawa and Shaw, 2004). Increasing community preparedness then entails behavioural change, with individuals taught or nudged towards what they should do and where they should go in response to a hazard-related early warning—and, importantly, identifying and helping others in serious need. Critical to this endeavour is getting schools and local education authorities on board, both to normalise disaster risk awareness in existing curricula, and because schools are often centres of community life (Wisner, 2006; Pichler and Striessnig, 2013; Shaw, Takeuchi, and Shiwaku, 2013). Educating children is crucial to DRR, not because they are 'passive' carriers or recipients of risk messaging, but rather because they are active sources and informants of everyday risk, and remain essential to preparedness and recovery across society (Mitchell et al., 2008; Martin, 2010; Marchezini and Trajber, 2017; Mort et al., 2018).

Such behavioural change clearly can save lives. Nevertheless, the tendency of behaviourist disaster education is to avoid discussing the underlying causes of vulnerability owing to poverty, hazardous urbanisation, development models, and entitlements or citizenship, matters largely beyond a population's direct control (Maricato, 2003; Wisner, 2006; Satterthwaite, 2013; Coates and Garmany, 2017). Contrastingly, community-based disaster management (CBDM) or community-based disaster risk reduction (CBDRR) draws on the ideas of Paulo Freire (1996), promoting the raising of awareness among people about the causes of their social or spatial marginalisation. Led by national or international NGOs, or occasionally state agencies, these critical pedagogic interventions have sought to foster community literacy and leadership, and to generate knowledge of multiple intersecting environmental and social risks (Maskrey, 1989; Heijmans, 2009; Wisner, 2006). In the Brazilian context itself, Freire was acutely cognisant of colonial inheritances that leave non-whites and the poor vulnerable to all kinds of everyday risks. Writing at the height of the dictatorship in the late 1960s—a developmentalist regime that enabled the migration of the rural poor to feed urban industrialisation—Freire led from the assumption that education is *always* implicitly political as it aims either to maintain or to change an existing social order. By extension, CBDM could empower the marginalised to transform their social reality. The escalating 'pressure' of vulnerability that results in a disaster might then be 'released' by capacitating local demands for legal inclusion, secure livelihoods, and equitable spatial planning (Wisner et al., 2004).

Although there are clear differences in objective between behaviourist and transformative education, informing programme design *and* delivery, these variances can be less marked in practice. Wisner's (2006, p. 55) landmark report on disaster education notes that *risk communication* may go beyond the 'functional activity' of saving lives and towards building awareness of:

> *the processes that block desirable changes in the root causes of [. . .] vulnerability – the laws, labor relations, land tenure, race relations, access to resources and many other institutional, economic and political elements.*

The social act of coming together to identify and mitigate risk can potentially lead to more fundamental local change when people strategise together for reasons of assistance or partnership with governmental or other civil actors. While usually less political in outlook, studies employing social capital theory also reach somewhat similar conclusions: risk interventions can have 'vertical' and 'horizontal' impacts, as vulnerable populations are empowered to 'bridge' with governmental or business actors to lobby for and gain greater control of their needs (Pelling, 2003; Nakagawa and Shaw, 2004; Butler et al., 2016). Beyond this, a key precept of *both* behaviourist and transformative approaches is experiential environmental education: to learn about the manifold ecological, geological, and developmental processes that lead to hazards and disasters, and how society can promote local safety (*cf.* Wisner, 2006; Núñez, Castro, and Cartea, 2017). In the case of floods and landslides in Latin America, such environmental education must undoubtedly incorporate disaster creation via settlement on deforested land, processes often initiated by developers or politicians external to the immediate locale.

Disaster education should be commended then for its ability to 'prepare for the risk that cannot be reduced' (Wisner, 2006, p. 7) *and* for working towards more equitable societies. Even so, a tension remains here regarding how the causes of disaster are framed; including, importantly, *what* risks *exactly* can and cannot be reduced. Probing this issue, Mitchell et al. (2008, pp. 271–273) suggest that without considering risk communication activities *together with* overriding institutional politics, they are highly unlikely to create positive change. Significant conflicts can manifest when trying to generate coherence and cooperation vis-à-vis disaster causation and response between policymakers, implementers, and other interested parties across multiple levels of governance—and these nuances of state political organisation can be part and parcel of the creation of disaster risk itself:

> [Y]outh-focused initiatives will have to challenge [. . .] the diverse epistemological paradigms within which practitioners [. . .] frame disaster management or risk reduction [. . . and] the formal and informal structures controlled by institutions [. . .] and guided by the political systems in place.

The case of Cuba is instructive here since it is widely considered to be an ideal model of effective preparedness (Thompson and Gaviria, 2004; Pichler and Striessnig, 2013). Its disaster education programmes in schools and by community civil defence, as well as the provision of hurricane shelter safety, are in many ways laudable. Yet, they are also impossible to comprehend without understanding broader state strategies for building trust, a sense of duty, and social coherence—alongside universal education and healthcare—in a context of political conflict with the United States (Coates, 2018). While displaying features of 'behaviourist' and 'transformative' disaster education, the approach fits wholeheartedly in neither realm simply because preparedness and practice cannot be separated easily from the wider political environment. Cuba may be seen as exceptional, but the theoretical point of political-

societal specificity must surely apply to *any* disaster preparedness case. Lessons *can* be learned from the country, but 'ideal' theoretical approaches to disaster education must be contextualised and tempered with respect to specific social–institutional settings.

In much of (the rest of) Latin America, transformative visions of education that locate vulnerability in political and economic structures are clearly an anathema to dominant top-down engineering, militarised emergency response, displacement of the poor, and the production of (ever more) data on the perils of external nature (*cf.* Hewitt, 1983; Gaillard and Mercer, 2013; Valencio, 2014). What underpins this dominant narrative in Brazil is a legacy of authoritarian developmentalism that has *produced* degraded and hazardous urban environments (Costa and Monte-Mor, 2002; Hochstetler and Keck, 2007; Coates, 2019). Most of those targeted for behavioural change via disaster risk messaging were encouraged to build in environmentally-sensitive or marginal locations—floodplains and mountainsides—precisely *because* of their marginalised status, leaving them vulnerable to the ramifications of storms *and* periodic heavy-handed evictions (Hardoy and Pandiella, 2009).

The framing of 'environmental problems' then becomes critical, not only in terms of disaster response policy, but also the level of trust that those in vulnerable positions have in governing institutions (Marchezini and Trajber, 2017). People are likely to view expert knowledge with suspicion when municipalities at one time encouraged hazardous settlement, and at another insist on eviction owing to disaster risk. Disaster education practitioners are left to facilitate sessions probing to what extent people should mitigate/adapt to exposure to 'objective', natural forces, or to exposure to the same state apparatus that facilitators themselves might be affiliated. State actors (or their contracted NGOs) asking people to be responsible for their *own* safety, when another arm of the state increased their risk, is of course a well-rehearsed critique of functionalist theories of social–ecological resilience (Cote and Nightingale, 2012). In the context of *dys*functional governance in Rio de Janeiro, Allen (1994, p. 107) found risk reduction work to be insufficient and arbitrary, with the poor left alone to 'pick themselves up from nothing'.

This is all in some ways reminiscent of what Olson (2000) aptly named 'disaster politics'—political conflicts surrounding the framing and causality of a disaster—which come to determine the way that (state) resources are fought over and allocated. *Conceiving of* and *implementing* disaster education requires mobilising policy, resources, and personnel that must cohere around a (relatively) unified approach. NGOs are frequently assumed to be the actors that will drive (transformative) education forward, yet their degree of autonomy from the state must be questioned when inevitably they have to engage with schools and other state institutions in political constituencies. 'Transforming society' may not be a politically-appropriate message to divulge. In the Brazilian urban context, state enforcement of environmental policies has generally been weak, which also leads to low expectations of enforcement (Hochstetler and Keck, 2007). When progressive policies *do* emerge they are regularly picked up and then dropped from one administration to another; consequently, 'we must look at them all the way through, from conception through

enforcement, because the completion of one phase does not guarantee progression to the next' (Hochstetler and Keck, 2007, p. 17). This affects not only how people relate to state DRR institutions, but also how they relate to one another as these interventions are carried out (Hochstetler and Keck, 2007, p. 17).

It is to these questions about trust, the state, and the political realities of disaster education that the rest of this paper turns. Where agreement on the cause of a disaster is unlikely to emerge, what are the background alliances and incongruities that inform how such education programmes are conceived and delivered? The clear importance of empowering young people to reduce risk is not in question; moreover, the context of how such programmes manifest and are received in vulnerable areas remains strangely underexplored. The 'ideal' contribution of education is clear, but often underplayed are the effects of competing understandings of risk and development that can pull participants in different directions, sometimes simultaneously.

Establishing disaster risk education in Nova Friburgo

The Mãos à Obra education and public outreach programme was implemented in three of the districts most affected by the storm in January 2011—one in each of three different cities. In Nova Friburgo, the heavily exposed valley of Córrego d'Antas, along with its neighbouring area of São Geraldo (together around 15,000 inhabitants), was chosen in the northwest of the city. There were numerous landslips here as well as catastrophic flash floods that resulted in approximately 100 deaths. A mixed-class district, Córrego d'Antas houses light industry along the valley floor, wealthier homes near the main road—100 metres uphill from the river—and poorer housing predominantly on higher mountain slopes and along sections of the riverbank. Like other city districts, it lost most of its forest cover to development, which has left much of it (but especially precarious dwellings) heavily exposed to mudslides, rock falls, and floods (Coates, 2019). As Sara and Gabriela, two young women who participated in Mãos à Obra, stated: 'we've always had tragedies here during summer storms, but never at the magnitude [of 2011]'. Deforestation, and the replacement of forest by cattle pasture, is strongly linked to the occurrence and seriousness of landslips, for reasons beyond what can be discussed here (Dean, 1995; FME, 2011; Nehren et al., 2013). Remaining patches of forest on steep inclines, however, have also *increased* landslide exposure owing to heavy rainfall, as higher-level cutting destabilises what are now overloaded slopes below. This type of physical exposure intersects with social vulnerability, including poverty and limited education, which are associated most evidently in Córrego d'Antas with (predominantly) female home-based livelihoods in unregulated sewing syndicates. Thus, more assets and resident hours centre on at-risk homes, and recovery is problematic because of minimal safeguards to protect against earning and livelihood losses.

The various links between existing patterns of development and the occurrence or gravity of hazards present an immediate problem for actors seeking to introduce

disaster risk education. Politics is dominated here by those with strong ties to urban industrial growth; for decades, unscrupulous developers have taken advantage of lax land governance, as well as pressure for cheap housing, to clear tracts of at-risk land and subdivide it to sell for self-build homes (Maricato, 2003; Coates and Garmany, 2017). Although illegal according to federal law, the municipality legal-ised these developments in order to collect local government tax (Imposto sobre a propriedade predial e territorial urbana or IPTU) and to enhance the vote base of political patrons. Almost all of the participants raised this matter in interview, with Sara and Gabriela saying in unison:

> It's a serious management problem when the municipality turns a blind eye when people build, but then makes sure it collects the tax. The one thing ends up influencing the other. But also, big commercial industries have built nearby, and the workers don't want to live far away.

With little will across Brazilian multi-level government to implement urban land regulations (Hochstetler and Keck, 2007; Hardoy and Pandiella, 2009), community safeguards and disaster preparedness remain a low priority. In this context, getting state actors to commit funds and expertise to educational outreach is a significant challenge. NGO engagement with Nova Friburgo was minimal in 2011, with only brief interventions by CARE and the Red Cross in a handful of local schools.

At the state level, as Hochstetler and Keck (2007) identify, stimulating action on issues such as environmental education and risk reduction almost always depends on being in power. This is not so much to 'dictate' policy but rather to gain sufficient patronage capital to build alliances to serve one's interests. Creating progressive legislation, for Hochstetler and Keck (2007, p. 17), *always* requires 'a separate mobili-zation of commitment [that depends] substantially on the voluntarism of committed individuals'. Following elections at the Rio de Janeiro state level in 2010, such a window of opportunity opened when the leftist Workers' Party (Partido dos Trabal-hadores or PT) became a junior coalition partner of the right-wing Democratic Movement Party (Partido do Movimento Democrático Brasileiro or PMDB), despite their strongly divergent ethea. The PT gained control of Rio de Janeiro state's bulky Environment Secretariat under the former federal minister and longstanding envi-ronmentalist, Carlos Minc, whereas the PMDB controlled most of the remainder, including the Education Secretariat. As Katia, the Mãos à Obra project leader under Minc, pointed out, there was 'zero cooperation' with the education secretary in the years after 2011, and hence they were unable to implement comprehensive disaster education across schools in affected areas. Instead, they targeted partnerships with municipal-level civil defence to form an evening and weekend programme to create young 'monitors' of local disaster risk—in effect, public mobilisers. Now receiving top-up funds from the state government, municipal civil defence welcomed their expansion into community preparedness and education, which took them some dis-tance beyond their existent focus on rescue and alarms.

The civil defence partnership gave the programme credibility and visibility locally, and specific schools were brought on board to provide out-of-hours classroom space. In some cases, this also encouraged regular teachers to become interested in the material. The sessions usually ran for two hours, one evening per week, with a half or full day on Saturday. Participants were also required to work another weekday evening to visit residents. Once per month on Saturday, Mãos à Obra opened up to community participation, attendance motivated by a free *feijão amigo*, a traditional lunch and social gathering. Facilitators and support staff were contracted on a monthly basis during the 18 months that the programme ran consistently (notwithstanding lengthy holidays), and civil defence played a key role, concentrating primarily on developing escape routes to shelters, household readiness, and community mapping. Two NGOs, the Red Cross and Novamerica—the latter a specialist in critical human rights education—ran five Saturday workshops over the course of a year. A young psychology student accompanied the sessions to support those who had suffered trauma. The core idea, following precepts of environmental and disaster education elsewhere, was for monitors to become reference points with regard to local environmental awareness, disaster preparedness, and evacuation, and to facilitate community cooperation and responsible governance (Freire, 1996; Thompson and Gaviria, 2004; Wisner, 2006; Shaw, Takeuchi, and Shiwaku, 2013). The programme's aims might then be seen at the outset as a conjunct of behaviourist and transformative education. Environment Secretariat personnel and their contracted NGOs would use the set-up to channel messaging on transformative societal change.

Nonetheless, with civil defence answerable to municipal mayors and their councillor coalitions, the programme unavoidably worked within the existing system. Without direct school involvement, it was challenging to get young people to volunteer as participants; the decision was taken, therefore, to pay trainee monitors a minimal stipend. Katia, the project leader, noted that at an early stage she 'almost closed the [Nova Friburgo] programme because councilmen were asking for money and forbidding us access without it'. As they wanted to avoid such 'overheads', the agreed solution was for local councillors to indicate a few participants to be trained as monitors and, as such, to receive the stipend. This in turn required that the programme admit a number of middle-aged members into an initiative ostensibly focused on 15–19 year olds, despite the varying degrees of commitment demonstrated by older participants. Bringing a new source of income, however minimal, into a political constituency had in effect left the programme vulnerable to exchanges of favours and votes. Consequently, politics infiltrated disaster education before the sessions even began. As one participant, Rafael, divulged, even beyond the 'indicated' participants, 'some people came for the money, to put food on the table [. . .]. Some were committed while others were there for the finance'. One or two were probably told by their parents to attend in order to bring the funds home. Of the 25 participants who started Mãos à Obra, 18 continued until its termination, with Rafael suggesting that only 12 really took it seriously.

Mãos à Obra thus started life unable to escape the politics of scale between the state, municipal, and district level. An old order of favours, conflict, and power, especially prevalent in Rio de Janeiro, was a first 'educational hazard' within a programme designed for the apparently apolitical cause of reducing casualties. While the programme aimed to tackle these conditions via transformative social change, it also operated according to the political norms that subsumed it. Education here could never be 'zero-sum' in the sense of imparting and facilitating participatory knowledge of a disaster, as it had to act in accordance with the political scripts and social facts in which it was based. This is not to say that Mãos à Obra was in any way worthless—as the next section shows—but rather to highlight how local contexts influence 'ideal' conceptualisations of disaster education as purported in the literature.

Preparedness and transformation

For Mãos à Obra's management, a key emphasis was generating learning among young people about the local environment—landscape change, watercourses and drainage, soil stability, and human settlement impacts—while also developing their social leadership tools to work with the community on evacuation behaviour, risk mapping, rainfall monitoring, and collaboration. As Katia detailed:

> We emphasised coping [mechanisms] to deal with these kinds of situations, to empower the community to believe that pro-active behaviour on risk must be done together with others. The idea was that the nucleus stays after we leave: a prevention culture [can emerge] and local people [can] multiply.

The pedagogic coordinator of the programme, Luiza, expanded on this point. Behavioural change based around emergency preparedness, area mapping, and evacuation routes to shelters was critical, but facilitators also problematised societal issues such as homophobia and other forms of discrimination with a view to increasing understanding of vulnerability *and* inclusive leadership. This would help emergency shelters to be viewed as safe, inclusive, places, and mobilise people actually to help vulnerable neighbours arrive there in an emergency. This work, though, for Luiza, also had the wider transformative aim of building a better society: 'from a situation where politicians helped people settle [in dangerous locations] to empowering residents to know their neighbourhood; to be active not passive recipients, but a subject of rights'.

According to Sara and Gabriela, for the period during which the programme ran, they *were* focused on creating a preventative culture. They recalled developing a Google Earth map together with civil defence staff, with escape routes and assembly points marked, and the whole district divided among the monitors. They visited all households in their area over time to discuss the issues and to encourage their attendance at community meetings. In their words:

As monitors we distributed kits including waterproof bags for people to keep important documents, and a manual of what to do when it rains, including showing evacuation routes. Then we found where the elderly, disabled, and wheelchair users lived, and appointed nearby individuals responsible for helping them. So we organised and mobilised people. In the past some individuals kept an [informal] eye on the river [but] when people received advice they didn't know what to do . . . what to take with them, etc. [. . .] Many people stayed at home [in the disaster] because they didn't want to leave valuables—but there's nothing more important than life.

Risk communication and preparedness based on the classroom training then extended right across the district. There was scant knowledge in 2011 of how many people lived in housing that had collapsed, and of who might have been away. As Sara and Gabriela noted:

When distributing their kits we learned how many people lived at that house. We made a register of people's medicines, and also helped them map their [material] assets—as after the disaster people couldn't prove what they owned before. Firefighters need to know that they've accounted for everyone that's gone missing.

The monitors discussed and educated about matter concerning the local environment, and established links with human behaviour, such as dumping, in relation to the construction of disaster risk. The flash flooding in 2011 was caused by breaches of dumped refuse higher up that had formed a barrage. Gabriela said: 'I think the whole neighbourhood is more aware as a result of our work, of sharing these experiences'.

Another young participant, João, from a poorer and significantly hazardous section of the valley, further detailed how behavioural change may be connected to longer-term transformation, especially in inclusive leadership:

We learned how to deal with different kinds of people, how to support them at a critical time, and understand that their religious views might be different or that some might not [be able to] speak. Much disaster prevention is related to learning to deal with people: I think we joined the community together a little—to show that at difficult times you need to leave certain differences aside. It's possible to live in society even with difference of attitude. [. . .] It was the practical work that was different from my point of view—the lessons always appeared in practice—from escape routes to dealing with diversity. Today we've changed: you stay calm; look what to do better, not to be cold with others in the same room [. . .] I started to speak with people I'd never had a conversation with; I gained skills that help me 'til today.

In this respect, the sessions undertaken on social cohesion and rights were provocative and rewarding, and demonstrated a longer-term impact on social change beyond 'disaster preparedness' in a narrow sense, however difficult to measure. Elisa, a middle-aged participant, underlined that 'the session on homophobia was the most significant and controversial as it affected people's [religious] values'. Rafael agreed:

> *We learned to respect all the opinions on the course; we had this scope to approach things like prejudice, homophobia, human rights. What I learned there I passed to my aunt, my father; he wanted to talk about these topics. Human rights and evacuating your house are completely linked: discrimination, racism; people need to respect each other, to make a better community. DRR can mean reducing homophobia or creating social solidarity, or replanting trees, or learning about soil quality. Today what is missing in schools is this kind of environmental education—it's essential.*

These quotes indicate strong awareness of intersecting environmental and social questions when seeking a composite approach to DRR, and the necessity of this kind of transformative educational work for addressing the basis of vulnerability in the longer term. Some Mãos à Obra participants developed the personal and professional leadership skills that the programme creators desired, despite questions about politicisation.

The sessions were not always cohesive, however. As a researcher, I observed on one occasion an expert facilitator run a (highly successful) participatory session on human rights and difference, followed by a much more authoritarian account of command–control evacuation by civil defence. This was of course part and parcel of a programme delivered by different voices—the same compromise that enabled it to exist in the first place. Although some sessions were delivered within a Freirean mode of participants' co-learning about key topics—with a view towards transformative change—a clearer pedagogic line emerged between that and a much more conventional educational approach aimed at altering public behaviour from the 'top down'. Ultimately it was for participants to decide what aspects to incorporate in their practice, and to fuse perspectives that elsewhere might be considered as incongruent. These issues regarding politicisation and differences about the causes of disaster no doubt reduced the programme's overall coherence, and, at times, classroom activities and facilitator organisation looked more improvised than planned. The programme's risk reduction achievements may then be seen as more blurred, with positive change in certain aspects. Yet, as the paper goes on to show, these actions on community preparedness and transformation were never able to overcome relationships of political scale between the locale and the multi-level state. In effect, this mode of risk reduction seemed to run in parallel with disaster risk *creation*, as a result of increasing socio-spatial vulnerability over time (Lewis and Kelman, 2012).

Hands *in* the public works!

After the disaster of 2011, hefty federal, World Bank, and state-level funds were mobilised for emergency public works, or *obras*, centring on dredging, bridge rebuilding, and riverbank reinforcement. These were followed by more extensive hillside containment and drainage schemes, including the creation of linear river parks. Many of these interventions caused controversy, with well-founded allegations made that

containment favoured high-value neighbourhoods and the properties of influential individuals over those most in need. That heavy engineering was chosen over reforestation and education is itself significant (Hewitt, 1983; Coates, 2019), but many engineering projects also required the eviction of those deemed to be living in at-risk areas. Polemics arose regarding who had the right to stay and in what time frame, as well as who would receive state housing rental support elsewhere. The government's position, headed by the technical arm of the Rio de Janeiro Environment Secretariat rather than the division responsible for environmental education, was complicated by its insensitivity in relation to approving evictions. Large red lettering signifying impending demolition appeared on peoples' homes while they were out at work, causing greater anxiety and anger for some than the disaster itself. Decisions were also often perceived as arbitrary: red lines on risk maps mysteriously moved after powerful individuals lobbied the municipality, and much backtracking occurred about who *exactly* was at risk.

Where public works or infrastructural *obras* had become the centrepiece of disaster management, the name Mãos à Obra was a play on words between the epithet 'get to work' (or literally 'hands on the job') and public involvement in and understanding of engineering-based DRR. For Katia, the project leader, it *necessarily* accompanied evictions:

> Engineers didn't know how to deal with people and wanted houses removed. There was lots of conflict, with red crosses marked on homes for removal. [The programme then became] a counterweight to this insensitivity [. . .] to show the community that we wanted to help; that we were on their side. In an environment of sadness, often mourning, [Mãos à Obra] is a place where you can get your hands dirty, contribute, and play a role.

The pedagogic coordinator, Luiza, added:

> As [dangerous] settlement [in Córrego d'Antas] was legalised by the municipality, people were in revolt because they paid local government tax, energy, and water bills. So, while we can say that City Hall was negligent, at the same time residents didn't want to leave their homes and lobbied for infrastructure to contain the water. People had no notion they were in a risk zone and said that there must be a technical solution. But you look at those hills and those rocks and think: there's nothing that can secure all of this! The whole city is in the wrong place!

Mãos à Obra was underpinned by ideas of social inclusion, community preparedness, and transformative leadership, yet it also sought to generate trust with and buy-in to the state's primary approach, based on risk science and infrastructure. To have hands *in* the public works was to show that the state cared for the population's preparedness and well-being, and that it could be a fair and objective actor. Mãos à Obra's transformative message was ultimately compromised by its initiation by a government whose dominant approach was capital-intensive, expert-led developmentalism,

designed to push back against 'incoming' nature. Initiated by the state, Mãos à Obra could never be deeply antagonistic of the wider approach.

This presented problems for the new monitors. Teaching in the classroom was in accordance with behaviourist and empowerment methodologies that sought to reduce casualties *and* to create social change. This had some success, but as they went about the neighbourhood they encountered deep distrust in the 'hard' interventions implemented by the same Environment Secretariat to which they were now affiliated. For Rafael:

> It was very complicated to go from house to house and talk about risk as it was a very big trauma [. . .] We clapped hands outside for people to let us in and they closed the windows! They thought we represented the government, which has little credibility. [The state] hadn't been very visible in Córrego d'Antas: houses were built on top of the river and the municipality taxed them, so they were implicated in the blame game. When evictions started, staff from the Environment 'social section' went in and said, 'you will now live [in another distant neighbourhood]'. But people have the identity of where they grew up. [. . .] Politicians promise the world: 'we're going to build an aquatic park; an industrial estate', but it never happens.

In Córrego d'Antas, the design for a linear park with community facilities had accompanied riverbank reinforcement and associated evictions. As Sara said:

> I even have the riverine park project video, but it never got started. They expropriated the area, took away several houses, but it did not even happen. There was also the case of a girl who lost her father in the disaster, and to demolish the house they took advantage and offered a value far below what it was worth.

Her friend Gabriela added:

> The [poorer settlement on the] other side of the valley always had landslides, and the bridges were weak to get back across the river. People just built little walls to try to protect themselves, but never really looked at what was above them. There was always talk of putting in a containment wall there, but they just built a temporary bridge that was never upgraded. It was the opposite of prevention.

Distrust was deeply evident given the failure of the state to deliver on its promises (Marchezini and Trajber, 2017), and suspicion increased owing to the prioritisation of infrastructure in high-value areas.

Contrary to what it had set out to do, Mãos à Obra was undermined by deep inconsistencies in the state's approach to land governance. Although based around education and outreach, in concrete ways it became another theatre of what scholars of Latin American politics call *obrismo*: systems of clientelism surrounding the exchange of *obras* for votes or favours, and which come to characterise relations in general between government and marginal populations in rapidly expanding cities

(*cf.* Diniz, 1982). Education programmes focused on imparting and debating knowledge of disaster risk by necessity *had* to negotiate or encounter this political terrain given the distrust in public authority that circulated among residents, including the participating monitors and their families. Project designers based curricula on pedagogic theory and environmental expertise, but, in practice, this would all have to be balanced with the politics of the (literal) matter in hand (Olson, 2000; Mitchell et al., 2008). Monitors presented residents with the case of dealing with objective threats from nature, while for many the risks were (also) strongly located within institutional authority. João, living high up on the mountainside, pointed out that:

> *on paper all the public works projects were wonderful, perfect. But the greatest fear is that we do not know the quality of the project execution. Many works were overpriced, or with costs inflated, and with inferior quality materials: we don't know where they got them! They planted some trees and rebuilt affected areas, but it is difficult to predict if it really holds.*

Preparedness in a politicised environment

With coalition government becoming increasingly strained throughout 2013, the PT exited the arrangement and a new Environment Secretary assumed the position in January 2014. According to Rafael, Mãos à Obra was 'reduced—one week, four visiting speakers came, the next week three, until there were none'. The programme then ended abruptly, with 'no closure or winding down', Gabriela recounted. Elisa, an older, active, participant, stated:

> *At the end of Mãos à Obra some received a certificate while others did not complete it [. . .] The big problem is that we had to pay people to participate [. . .] It stopped because the funding stopped; people couldn't continue as volunteers. It became obvious that the programme continued in the Baixada [in metropolitan Rio] after [Environment Secretary] Minc left, and when our monitors realised that it was funded much more there, they lost interest and were very indignant.*

The new Environment Secretary, Indio da Costa, with no background in environmental issues or in the Nova Friburgo area, was suspected of funding Mãos à Obra elsewhere where it could furnish his client base. Slightly more than one year later he was prosecuted for illegally deforesting hillside land to build a mansion house (Cabellero, 2016). For Rafael:

> *We lost credibility mainly because of lack of funds. [. . .] When we were almost ready to fly, they cut off our wings. [. . .] It is part of their role to protect people, but the tragedy we learned was the responsibility of public authority, of the municipality, so people knew [disaster response] was a game. The blame game; throwing the blame on the other, we noticed this clearly in the workshops. [Politicians] promise all kinds of things but they're rarely done. People lose faith that anything can change, and then sell their vote. It makes*

the country fragile. A person sees someone else doing it and does the same. A politician can retire after two mandates, with a full salary!

Clearly, just as political manoeuvres had enabled the start of the programme, with good (however questionable) intentions, politics had also terminated it. As the 2011 disaster began to fade from memory, and flooding in metropolitan Rio became the latest crisis, political emphasis was placed elsewhere.

The previous quote, however, also highlights the personal learning and development of the participants. All of those interviewed were strongly affected, demonstrating learned knowledge of their own environmental reality and its links with political organisation. The programme motivated some to follow new career paths in which this learning would be taken forward. Rafael trained to be a forest engineer, and pointed out that he was trying to engage the municipality in a school reforestation project. Sara and Gabriela said that 'the base we gained from Mãos à Obra was to know really what was legal or not, what shouldn't happen, who is acting illegally; to know that we don't have to settle for everything that happens'. They had both begun legal training and also became more active in the residents' association. They agreed that its capacity to 'make noise' about deforestation and new risks had increased. All of the participants asserted that they felt more confident in leadership, including in welcoming new knowledge and respecting the ideas of others. It is these points that come closest to identifying transformative change. As Luiza acknowledged, despite the project's failings, 'where you plant a seed, you don't know where it will end up.'

In terms of more 'direct', behaviourist, disaster preparedness, there were also long-term effects in Córrego d'Antas. As of 2017, one-half of the Mãos à Obra group still corresponded via the WhatsApp messaging platform during heavy rains, and they also maintained an amateur radio network in case communication was lost, linked to another one higher up the river to warn of overflows. For João, now working in housing foundation construction, directly following his Mãos à Obra experience:

I learnt about the perception of problems and possible solutions: before I didn't have this, for example about landslides and heavy rain. Now I know exactly what can happen. I always lived [in the favela] and our problem is the falling boulders; but I learnt about the river too. [. . .] The main thing I learnt was knowledge and respect. Many people changed the way they thought.

Gabriela and Sara shared this sentiment, relating how learning to respect and communicate with others was beneficial to emergency evacuation:

The teachers opened our universe, both the technical part from civil defence and more human questions and rights. [. . .] If you can be more human during a disaster, dealing with others is much easier. Sometimes people do not want to leave their house, and you need to convince them that it's better and safer. Without the classes we would not have had this awareness.

Looked at in this way—with analogies to the language of social capital—participants had increased horizontal and vertical capital, linking themselves to each other as well as bridging with and lobbying higher-level actors.

This said, there remained the sense in Nova Friburgo that altering behaviour in relation to (apparently objective) 'external' risk would be compromised by wider development. The slow pace of 'transformation' led by participants themselves was contradicted by the continuation of urbanisation *via* destructive land governance. As João detailed, with the riverine park unstarted:

> *most condemned houses are once again occupied; those not demolished arranged electricity and water; there is always someone to get help from to return to live without permission. [. . .] There might be another disaster because we don't have prevention. The government won't repeat the course—I feel privileged to have participated—here they did things after the tragedy but a prevention system they did not.*

According to Sara:

> *There were more landslides at [the other side of the valley] in 2015, and people were evicted, but went back to live there as they couldn't afford to rent elsewhere: they were simply left to re-inhabit a landslide site with one or two houses still standing in the middle. [. . .] Without money there is no way out. Some [affected in 2011] were offered an apartment far away [in a new development] that became one of the biggest drug spots in the city. Different criminal factions in favelas were put together, causing new conflict, so people returned.*

While there were questions about some condemned properties that were being rented out by their former owners—so they could pay higher rent in safer districts—many returnees had simply found the risks of being far from their workplace or community greater than the risk of mud and water descending from above them.

As the interview with Rafael neared its conclusion, he suggested a one-kilometre drive along the nearby Estrada do Girassol (Sunflower Street), at the fringe of the city. A large tract of land had been recently deforested, and the first markings of a housing subdivision were laid out. As he emphasised:

> *This is being parcelled out, with no regulation. [The mayor] indicated his favourite for the [local representative of the] Rio de Janeiro Environment Secretariat; next thing you know they've turned a blind eye to this. This subdivision is exactly where a landslide came down in 2011, and it was earmarked for reforestation. Now a new housing lot is approved [. . .] Heavy rain could bring this all down.*

All of the respondents in 2017 were conscious of this development's ability to *create* a disaster. In the face of such blind profit-seeking and regulatory failings, vulnerable residents learning to cope with their hazardous reality through education appeared almost placatory given its inability to address the real construction of risk.

Conclusion

Drawing on an in-depth case in Brazil, this paper has posited disaster education as a politicised terrain subject to multiple 'educational hazards'. These are the social, institutional, and political economic forces that pull participants, progressive policy, and educational practice in multiple and conflicting directions. DRR education is frequently held up as the enlightened alternative to the dominant technical and militarised response, yet this paper has shown that, in practice, politics also comes to frame and undermine strategies for preparedness and community empowerment.

This may not be a surprise, of course, given the political economic weight behind developmentalism and urban growth, in Latin America as elsewhere. Environmental protection and regulating hazardous development come a clear second to economic growth and 'progress'. When this is the case, however, disaster education scholarship based on risk communication and behaviourism *or* critical-transformative social change should also attempt a nuanced analysis of *who* will implement it, the compromises that may have to be made, and the forces that might compel individuals to take part or withdraw. Behaviourist and transformative approaches remain useful ideal–theoretical types, but they are located some distance from the field. Above all, transformative disaster education can be undermined by a lack of consensus—within 'outside' implementing institutions as much as in localities—on the cause of a disaster. In this location, the politics of risk creation overwhelmed real advancement with regard to risk reduction, since it was not clear to most actors whether or not the risks of 'nature', or those of engagement with different layers of the state, caused their vulnerability. Residents managed an array of risks and adjusted their behaviour accordingly.

This rich, in-depth case study of Nova Friburgo, Brazil, reveals that there is no substitute for effective land regulation and (urban) governance, and that, at worst, DRR education prepares vulnerable people for the continued generation of disasters. Education can be a tremendous force for social change, but it can also swim meekly against the current—and its results may even be opaque. That said, for a number of Mãos à Obra's individual participants, they benefitted tremendously from an education not otherwise accessible to them, and one cannot discount the possibility that they will go on to challenge the dominant political causes of disasters throughout their lives.

Acknowledgements

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Endnotes

[1] The Brazilian educator and philosopher, Paulo Reglus Neves Freire, was a principal advocate of critical pedagogy.

References

Allen, E. (1994) 'Political responses to flood disaster: the example of Rio de Janeiro'. In A. Varley (ed.) *Disasters, Development and Environment*. Wiley, London. pp. 99–108.

Araújo, J.R. and J.M. Mayer (eds.) (2003) *Teia Serrana: Formação Histórica de Nova Friburgo*. Editora ao Livro Técnico, Rio de Janeiro.

Burawoy, M. (2009) *The Extended Case Method: Four Countries, Four Decades, Four Great Transformations, and One Theoretical Tradition*. University of California Press, Berkeley, CA.

Bustillos Ardaya, A., M. Evers, and L. Ribbe (2017) 'What influences disaster risk perception? Intervention measures, flood and landslide risk perception of the population living in flood risk areas in Rio de Janeiro state, Brazil'. *International Journal of Disaster Risk Reduction*. 25 (October). pp. 227–237.

Butler, C., K. Walker-Springett, W.N. Adger, L. Evans, and S. O'Neil (2016) *Social and Political Dynamics of Flood Risk, Recovery and Response*. University of Exeter, Exeter.

Cabellero, M. (2016) 'MP cobra Indio da Costa por desmatar área para erguer casa'. *O Globo Brasil*. 24 September. https://oglobo.globo.com/brasil/mp-cobra-indio-da-costa-por-desmatar-area-para-erguer-casa-20172322 (last accessed on 4 March 2020).

Coates, R. (2018) 'Cuba, Irma, and ongoing exceptionalism in the Caribbean'. *Alternautas*. 5(2). pp. 56–65.

Coates, R. (2019) 'Citizenship-in-nature? Exploring hazardous urbanization in Nova Friburgo, Brazil'. *Geoforum*. 99 (February). pp. 63–73.

Coates, R. and J. Garmany (2017) 'The ecology of citizenship: understanding vulnerability in urban Brazil'. *International Development Planning Review*. 39(1). pp. 37–56.

Costa, H. and R. Monte-Mór (2002) 'Urbanization and environment: trends and patterns in contemporary Brazil'. In D. Hogan, E. Berquó, and H. Costa (eds.) *Population and Environment in Brazil: Rio + 10*. CNPD (National Population and Development Commission of Brazil), ABEP (Brazilian Association of Population Studies), and NEPO (Population Studies Center), Campinas. pp. 127–146.

Cote, M. and A.J. Nightingale (2012) 'Resilience thinking meets social theory: situating social change in socio-ecological systems (SES) research'. *Progress in Human Geography*. 36(4). pp. 475–489.

Dean, W. (1995) *With Broadax and Firebrand: The Destruction of the Brazilian Atlantic Forest*. University of California, Berkeley, CA.

Diniz, E. (1982) *Voto e máquina política: patronagem e clientelismo no Rio de Janeiro*. Paz e Terra, Rio de Janeiro.

FME (Federal Ministry of the Environment, Government of Brazil) (2011) *Relatório de Inspeção: Área atingida pela tragédia das chuvas: Região Serrana do Rio de Janeiro*. February. https://www.mma.gov.br/estruturas/182/_arquivos/relatoriotragediarj_182.pdf (last accessed on 4 March 2020).

Freire, P. (1996) *Pedagogy of the Oppressed*. New revised edition. Penguin Books, London.

Gaillard, J.C. and J. Mercer (2013) 'From knowledge to action: bridging gaps in disaster risk reduction'. *Progress in Human Geography*. 37(1). pp. 93–114.

Hardoy, J. and G. Pandiella (2009) 'Urban poverty and vulnerability to climate change in Latin America'. *Environment and Urbanization*. 21(1). pp. 203–224.

Heijmans, A. (2009) *The Social Life of Community-based Disaster Risk Reduction: Origins, Politics and Framing*. Disaster Studies Working Paper 20. February. Aon Benfield, UCL Hazard Centre, University College London, London.

Hewitt, K. (1983) 'The idea of calamity in a technocratic age'. In K. Hewitt (ed.) *Interpretations of Calamity from the Viewpoint of Human Ecology*. Allen and Unwin, Boston, MA. pp. 3–32.

Hochstetler, K. and M. Keck (2007) *Greening Brazil: Environmental Activism in State and Society*. Duke University Press, Durham, NC.

Lewis, J. and I. Kelman (2012) 'The good, the bad and the ugly: disaster risk reduction (DRR) versus disaster risk creation (DRC)'. *PLoS Currents Disasters*. 4 (21 June). doi: 10.1371/4f8d4eaec6af8 (last accessed on 4 March 2020).

Marchezini, V. and R. Trajber (2017) 'Youth-based learning in disaster risk reduction education'. In M. Companion and M.S. Chaiken (eds.) *Responses to Disasters and Climate Change: Understanding Vulnerability and Fostering Resilience*. Routledge, New York, NY. pp. 27–36.

Maricato, E. (2003) 'Metrópole, legislação e desigualdade'. *Estudos Avançados*. 17(48). pp. 151–166.

Martin, M.L. (2010) 'Child participation in disaster risk reduction: the case of flood-affected children in Bangladesh'. *Third World Quarterly*. 31(8). pp. 1357–1375.

Maskrey, A. (1989) *Disaster Mitigation: A Community Based Approach*. January. Oxfam, Oxford.

Mitchell, T., C. Haynes, N. Hall, W. Choong, and K. Oven (2008) 'The roles of children and youth in communicating disaster risk'. *Children, Youth and Environments*. 18(1). pp. 254–279.

Mort, M., M. Walker, A.L. Williams, and A. Bingley (2018) 'From victims to actors: the role of children and young people in flood recovery and resilience'. *Environment and Planning C: Politics and Space*. 36(3). pp. 423–442.

Nakagawa, Y. and R. Shaw (2004) 'Social capital: a missing link to disaster recovery'. *International Journal of Mass Emergencies and Disasters*. 22(1). pp. 5–34.

Nehren, U., A. Kirchner, D. Sattler, A.P. Turetta, and J. Heinrich (2013) 'Impact of natural climate change and historical land use on landscape development in the Atlantic forest of Rio de Janeiro, Brazil'. *Anais Da Academia Brasileira de Ciências*. 85(2). pp. 497–518.

Núñez, M.B., C.M. Castro, and P.M. Cartea (2017) 'Environmental education in times of crisis. Where is it when it is most necessary?' *Ambiente and Sociedade*. 20(3). pp. 135–154.

Olson, R.S. (2000) 'Toward a politics of disaster: losses, values, agendas and blame'. *International Journal of Mass Emergencies and Disasters*. 18(2). pp. 265–287.

Pelling, M. (2003) *The Vulnerability of Cities: Natural Disasters and Social Resilience*. Earthscan, London.

Pichler, A. and E. Striessnig (2013) 'Differential vulnerability to hurricanes in Cuba, Haiti, and the Dominican Republic: the contribution of education'. *Ecology and Society*. 18(3). Article no. 31. http://dx.doi.org/10.5751/ES-05774-180331 (last accessed on 4 March 2020).

Rademacher, A. (2015) 'Urban political ecology'. *Annual Review of Anthropology*. 44(1). pp. 137–152.

Satterthwaite, D. (2013) 'The political underpinnings of cities' accumulated resilience to climate change'. *Environment and Urbanization*. 25(2). pp. 381–391.

Shaw, R., Y. Takeuchi, and K. Shiwaku (2013) 'Disaster education in schools'. In A. Lopez-Carresi et al. (eds.) *Disaster Management: International Lessons in Risk Reduction, Response and Recovery*. Routledge, London. pp. 82–96.

Shiwaku, K. and R. Shaw (2008) 'Proactive co-learning: a new paradigm in disaster education'. *Disaster Prevention and Management: An International Journal*. 17(2). pp. 183–198.

Slovic, P. and E. Weber (2002) *Perception of Risk Posed by Extreme Events.* Paper prepared for the 'Risk Management Strategies in an Uncertain World' conference, Palisades, New York, NY, United States, 12–13 April 2002. https://www.ldeo.columbia.edu/chrr/documents/meetings/roundtable/white_papers/slovic_wp.pdf (last accessed on 4 March 2020).

Thompson, M. and I. Gaviria (2004) *Weathering the Storm: Lessons in Risk Reduction from Cuba.* Oxfam, Boston, MA.

Valencio, N. (2014) 'Dos desastres recorrentes aos desastres à espréita'. In A. Zhouri and N. Valencio (eds.) *Formas de matar, de morrer e de resistir: limites da resolução negociada de conflitos ambientais.* Editora UFMG, Belo Horizonte. pp. 277–316.

Wisner, B. (2006) *Let Our Children Teach Us! A Review of the Role of Education and Knowledge in Disaster Risk Reduction.* UNISDR (United Nations Office for Disaster Risk Reduction)/Books for Change, Bangalore.

Wisner, B., P. Blaikie, T. Cannon, and I. Davis (2004) *At Risk: Natural Hazards, People's Vulnerability, and Disasters.* Second edition. Routledge, London.

Wisner, B. et al. (2018) 'Communication with children and families about disaster: reviewing multidisciplinary literature 2015–2017'. *Current Psychiatry Reports.* 20(73). pp. 1–9.