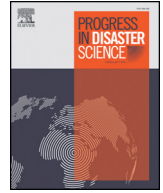


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Review Article

Axioms and actions for preventing disasters

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Contents

1. The knowledge exists	1
2. Axioms for preventing disasters.	1
2.1. Disasters are social, not environmental, processes.	1
2.2. Disasters are caused by vulnerabilities	2
2.3. Disasters are slow-onset.	2
2.4. Natural disasters do not exist	2
2.5. Exceptions occur	2
3. Actions for preventing disasters.	2
3.1. Relevant: preventing disasters is for everyone now	2
3.2. Resource-effective: preventing disasters is a wise investment	2
3.3. Continuous: preventing disasters never stops, instead requiring ongoing processes	2
3.4. Visible: preventing disasters must be prominently seen to succeed	2
3.5. Sexy: preventing disasters is exciting, so people always volunteer	2
4. Contextualising disaster axioms and actions	3
Conflict of interest	3
References	

1. The knowledge exists

Disasters have long captured human imagination and attention, both in terms of their consequences and trying to prevent them. In seeking to understand and explain disasters, so much discourse frequently avoids admitting and tackling the long-identified fundamental reasons why disasters are permitted to occur; that is, society's values and attitudes.

This situation emerges in two principal ways. First, a focus on impacts and post-disaster work, termed the “research gold rush” ([9], p. 1), distracts from pre-disaster studies and actions. Rather than aiming for consideration and resolution before a disaster manifests, attention and resources tend to be provided after it is too late. Second, with the basis that disaster risk combines hazard and vulnerability [25], disaster causes are misidentified as emerging from the hazard component, thereby veering away from vulnerability processes.

This paper explores shifting the discourse back to basic axioms of why disasters happen so that fundamental actions for applying the axioms can be provided. It summarises key points which are known from past decades of disaster-related research, policy, and practice, aiming for straightforward communication. As such, this paper aims to minimise jargon which has

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developed during the recent decades of disaster-related work. For example, rather than expressing exposure as a separate concept, and rather than delineating different risk forms such as extrinsic and intrinsic risk, the core elements of disaster risk are accepted here as being hazard and vulnerability (including exposure). Similarly, rather than phrases such as “disaster risk reduction” and “disaster risk management”, the definitions of which have changed substantially over time, the goal here is articulated as “preventing disasters”, while recognising that this phrase is also not entirely satisfactory.

This paper's material is divided into two core sections, disaster axioms and disaster actions, sandwiched by this introduction and a conclusion for wider discussion. Disaster axioms present a baseline ethos for preventing disasters, partitioned into five statements which are then elaborated. For disaster actions, five adjectives are provided and detailed.

2. Axioms for preventing disasters

2.1. Disasters are social, not environmental, processes

The much-discussed definition of “disaster” inevitably has a baseline of a disruption to society [21,22,24]. That is, disasters by definition are about society, so if humans or society are not unduly affected—which could also

be society valuing the environment—then it is not a disaster. Consequently, disasters are not about the environment, but are about society.

2.2. Disasters are caused by vulnerabilities

Vulnerability dictates how society and elements within society are or could be impacted by hazards. Vulnerabilities are not just about the current state of possible impacts, but are also about the societal (encompassing political, historical, and cultural) processes which led to the current state and the possible futures which could emerge from the current state [18]. Vulnerabilities are about what humanity does to itself over time and space, most notably what some sectors do to other sectors. A strong correlation between vulnerability parameters and disaster impacts exists, while the correlation between hazard parameters and disaster impacts tends to be much weaker [12].

2.3. Disasters are slow-onset

Hazards or potential hazards might be rapid-onset, such as tsunamis and tornadoes, but vulnerabilities and hence disasters result from society's actions over the long-term [17]. For example, an earthquake occurs quickly with little warning or lead-time, yet it takes a long time for the planning, building codes, construction, inequities, resource distribution, and lack of options to manifest in such a way that buildings collapse and kill people [3].

2.4. Natural disasters do not exist

Disasters are caused by vulnerabilities which are entirely societal processes meaning that disasters are not natural. Disasters are caused by society and societal processes, forming and perpetuating vulnerabilities through activities, attitudes, behaviour, decisions, paradigms, and values.

2.5. Exceptions occur

Examples of exceptions for which reducing planetary-wide vulnerabilities for the human race might not be possible are Milankovitch cycles altering climate [10], basaltic flood eruptions [14], gamma ray flares [20], supernovae [6], and sudden flips of the Earth's magnetic field [4]. In some cases, moving off-planet would prevent a disaster, although the societal disruption would still be significant. In other cases, a new solar system or an entirely self-contained world would be needed, again causing significant societal disruption. In a few cases, such as gamma ray flares, enough warning to evacuate the planet would not be forthcoming.

3. Actions for preventing disasters

3.1. Relevant: preventing disasters is for everyone now

Preventing disasters should positively and tangibly impact day-to-day living, such as through improved drinking water, shelter, choices, energy, resources, food, education, and livelihoods. Health, safety, and lifestyle choices—for example, crossing the road, wearing seatbelts, house fires, infectious diseases, non-communicable diseases, drunk driving, distracted driving, and smoking—are often made relevant to different audiences in order to encourage behaviour change. Lessons are available for vulnerabilities and disasters. Analysing causes of vulnerabilities, and hence disasters, as part of primary and secondary school curricula—emulating how health, safety, and lifestyle issues are included—would be a step forward.

A deeper question is how much different time scales should be connected. Would tackling assault, smoking, drugs, alcohol, road safety, home safety, violence, and crime assist with generating interest and impetus for tackling wider vulnerabilities (e.g. [16])? Would mentioning millennium-scale and planetary-wide hazards, including hazard influencers such as contemporary climate change, garner interest for smaller scales or distract from them (e.g., see [8])?

3.2. Resource-effective: preventing disasters is a wise investment

Preventing disasters saves substantial amounts of resources compared to letting disasters happen, providing paybacks across many time scales [23]. Nevertheless, for many people, particularly those who subsist or have limited resources (which is almost all of the world's population), an investment with a short payback period of weeks to months is too long. If people are asked to contribute to preventing disasters—such as through resources, time, effort, or attention—they deserve nearly immediate payback and they deserve payback irrespective of hazards or potential hazards manifesting. The payback is through reducing vulnerabilities in order to positively affect everyone's daily life.

Additional aspects to examine:

- Who saves resources and who does not save resources? Answering this question would help to identify (i) inherent inequities and (ii) who might oppose needed actions because they gain, almost inevitably in the short-term only, from others' vulnerabilities and disasters.
- What are the gains and costs, and for whom, across multiple timeframes and spatial scales?
- How much is the inadequate resources for preventing disasters about inadequate resource allocation, rather than lack of resources?

3.3. Continuous: preventing disasters never stops, instead requiring ongoing processes

Preventing disasters is not about a single or one-off action. The task cannot be done once and then forgotten nor can it be separated into its own, isolated realm, silo, or deliverable. Preventing disasters means processes covering how people think and behave, such as attitudes, paradigms, values, and cultures [15]. The past and the possible futures ought to be considered and examined in addition to the present. In line with vulnerability science [11,12,18,25], questions to be answered include not only “What state are we in?”, but also “How did we get here?”, “Where are we going?”, and “Where should we be going?” Preventing disasters should be part of usual, day-to-day lives as continuous processes.

3.4. Visible: preventing disasters must be prominently seen to succeed

An aircraft landing in a disaster zone, an aid worker wearing their agency's logo, or a celebrity strolling through a humanitarian situation provides a popular news feed [5] and generates social media support. Preventing disasters, notably tackling vulnerabilities before a disaster occurs, should be similarly visible. Many examples of successfully and visibly dealing with disasters exist; for instance, the lack of damage to modern infrastructure in the 2001 Seattle earthquake [7] and Bangladesh's warning and evacuation before cyclones make landfall [19]. Documenting and publicising these successes more systematically and more prominently would help.

One challenge is that dramatic, convincing, and communicable contrasts tend to require a disaster to have happened. An example is two houses experiencing a similar hazard, one of which is wrecked and one of which remains unscathed, as is seen in many wildfires and earthquakes. Using these comparisons assists, although explanations are also required for why the difference is seen, both technically and socially. What were the specific measures implemented for the undamaged house? Why were these measures implemented for the remaining house but not for the ruined house?

3.5. Sexy: preventing disasters is exciting, so people always volunteer

The post-disaster excitement of response, recovery, and reconstruction is prominent. How could preventing disasters be made to be as enriching, fascinating, satisfying, rewarding, and fun? How could everyone be inspired to be involved in preventing disasters, not merely as a duty but also because we all wish these actions to happen and actively seek to

support them? One example is having prevention successes publicised to the same level of prominence as disasters, as per Section 3.4.

A possibility for sexiness might be producing reality television programmes on preventing disasters. Care is needed not to cause more harm than good. Accusations of silliness could be valid for *Big Disaster Sibling*: In next week's episode, who has not prepared for the Big One? Similarly, a walkthrough of royal palaces for disaster prevention would garner a big audience while reinforcing monarchical power structures. Could a balance be achieved through creating *Catastrophe Survival* on a desolate island to be affected by some hazard or a game show such as *Emergency Maze* in which teams solve disaster prevention conundrums?

4. Contextualising disaster axioms and actions

The disaster axioms and actions do not suggest that the environment, society, and their inextricable interactions are fully understood, nor that full control is obtainable or desirable over the environment, society, or their connections. Instead, the axioms and actions indicate that society has a duty, obligation, and responsibility to understand and deal with ourselves, namely vulnerabilities. We know how to prevent disasters and we have the knowhow, skills, and resources to do so, including dealing with the numerous uncertainties and unknowns. Failures, namely disasters, are not indicative of a problematic environment, but of a problematic society. The responsibility rests with society for the choices made in priorities, values, and behaviours by those who have the power and resources to make those choices.

Starting points for galvanising the actions need to be explored—because the axioms might not be the most effective beginning. Should human rights, human duties, inclusivity, equity, and other baseline societal principles be used as impetuses towards activity? Or would beginning with on-the-ground needed work bolster the principles sought? Perhaps a combination of both would succeed most in preventing disasters, creating a repertoire which is selected from, depending on the contexts and the people involved. What balance would be most useful between fear based on disaster consequences and hope based on avoiding disaster consequences?

Answering these questions would provide insights into how to move away from interest in (i) impacts and post-disaster work and (ii) hazards and hazard influencers, such as contemporary climate change. All-hazards approaches are frequently touted (e.g. [1,2]). How could all-vulnerabilities approaches, emerging directly from the axioms and actions, be placed higher up on the agenda? From some of the origins of disaster research in hazardousness [13], should vulnerability be pursued?

Everyone has a right to demand, and a responsibility to contribute to, preventing disasters. The processes are not about charity and should not occur through the benevolence of “donors” helping “beneficiaries”. They are about supporting everyone while helping oneself, given that immense advantages individually and collectively are seen when supporting oneself and others to prevent disasters.

The key is producing understanding of, acceptance of, and acts of change for tackling the fundamental causes of vulnerabilities which cause disasters. Axioms and actions for avoiding disasters hopefully provide steps along this pathway.

Conflict of interest

None.

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