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# Connecting theories of cascading disasters and disaster diplomacy

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ABSTRACT

Disaster diplomacy examines how and why disaster-related activities (disaster risk reduction and post-disaster actions) do and do not influence peace and conflict processes, especially whether or not a causal chain can be established between dealing with disaster risk or a disaster and outcomes in peace or conflict. Cascading disasters might provide a useful theoretical framing for mapping out causal pathways for disaster diplomacy. In conceptually exploring the intersection between disaster diplomacy and cascading disasters, this paper concludes that both disaster diplomacy and cascading disasters have limitations because they try to develop focused causal chains which, when examined with respect to the root causes of disasters, are actually multiple, complex, intertwined causal chains. This situation does not obviate analysis or understanding of disaster diplomacy and cascading disasters. It emphasises the need to adopt and retain social perspectives from the root of disaster studies.

## 1. Introduction

This paper presents a conceptual exploration of disaster diplomacy intersecting with cascading disasters to advance the theory of both fields. Cascading disasters refer to progressions of disaster-related impacts which are said to produce multiple cause-effect chains. Disaster diplomacy examines how and why disaster-related activities (disaster risk reduction and post-disaster actions) do and do not influence peace and conflict processes. The keys for both cascading disasters and disaster diplomacy are (i) whether or not a causal chain can be established between the beginning of a disaster or a disaster-related activity and (ii) the resulting consequences. For cascading disasters, this causal chain leads to the ultimate disaster impacts witnessed. For disaster diplomacy, the causal chain is from dealing with disaster risk or a disaster towards outcomes in peace or conflict. Given the parallels between disaster diplomacy and cascading disasters, the latter might provide a useful theoretical framing for mapping out the former's causal pathways.

The next section examines and critiques the theory of cascading disasters followed by the third section providing similar material for disaster diplomacy. Both sets of critiques have parallels, indicating the importance of examining cascading disasters and disaster diplomacy together. These points are consolidated in the fourth section which indicates how disaster diplomacy, disaster risk reduction, and disasters are a series of interconnected cascades and thus intersect well with cascading disasters theory. The conclusions summarise this paper's contributions.

## 2. Theory and critiques of cascading disasters

### 2.1. Defining cascades

Recent discussion within disaster risk reduction has been exploring and developing the notion of “cascading disasters” or “cascading effects” [55]. The definition provided by Pescaroli and Alexander [55] is:

> Cascading disasters are extreme events, in which cascading effects increase in progression over time and generate unexpected secondary events of strong impact. These tend to be at least as serious as the original event, and to contribute significantly to the overall duration of the disaster's effects. These subsequent and unanticipated crises can be exacerbated by the failure of physical structures, and the social functions that depend on them, including critical facilities, or by the inadequacy of disaster mitigation strategies, such as evacuation procedures, land use planning and emergency management strategies. Cascading disasters tend to highlight unresolved vulnerabilities in human society. In cascading disasters one or more secondary events can be identified and distinguished from the original source of disaster.

Examples given include (i) 11 March 2011 when an earthquake off the coast of Japan led to a tsunami which killed thousands of people and damaged a nuclear power plant; (ii) the 2002 floods in Central Europe leading to power plants being knocked offline and chlorine gas

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cloud being released; and (iii) the 2010 eruption of Eyjafjallajökull volcano in Iceland which closed most European commercial air flights.

The ethos behind the original theory of cascading disasters and cascading effects is twofold. First, a non-cascading disaster is said to have a single cause which propagates linearly through sequential events in a chain connected by readily identifiable mechanisms. Second, a cascading disaster begins with a single cause with one or several specific mechanisms leading to consequences, but each consequence can be both an effect and a cause of other effects. Each dual cause/effect stage leads to its own causal chains of further effects which might also be potential causes. The chains end when only effects are seen which eventually peter out.

This theory of cascading disasters can be examined and critiqued in three fundamental ways. First, the delineation of cause and effect. Second, the mechanisms of transitioning from causes to effects. Third, the assumption of the "unexpected", "unanticipated", and "secondary" descriptors within the definition of "cascading disasters.

### 2.2. Cause and effect

The first critique, examining the delineation of cause and effect within a disaster, requires returning to basic definitions and seminal literature from disaster research. Defining a disaster has long been discussed (e.g. [58]. UNISDR [65] recently defined a disaster to be "A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts". This definition matches the history of the field of disaster research which accepts that disaster risk is a combination of hazard and vulnerability and, while the hazard can be a trigger, catalyst, influencer, or input into the disaster, the real and root cause of disasters is vulnerabilities [26,28,3,44,67].

From the disaster literature's baseline [26,28,3,44,9] and more recent expostulations [12,16,4,41,67], vulnerability is a long-term, multicausal, deep-rooted process within society. It describes quantitatively and qualitatively how people live, where they live, why they live in these ways and these locations, and what they can and cannot do about their situation. Vulnerability is rooted in political, cultural, and historical processes leading to individuals and groups having differing levels of power, resources, abilities, and options to deal with their situation, including hazards which might impact them, vulnerabilities they experience, and approaches for tackling their vulnerabilities. Everyone has some modicum of power, resources, abilities, and options, but many individuals and groups have much more than others, so they can choose to use their situation to create or reduce vulnerabilities for themselves and for others. Too frequently, vulnerabilities and disasters are considered minimally, leading to the creation of disaster risk through augmenting or failing to deal with vulnerabilities. Consequently, vulnerabilities are an ever-present, chronic condition which would be known and identified if action were taken to do so. Yet the typical situation is that vulnerabilities are accepted and discussed mainly after a disaster has occurred which reveals these vulnerabilities.

As such, disaster theory provides a poignant critique of the model of cascading disasters. Since disasters are caused by vulnerabilities and each vulnerability is multicausal, no single cause of a specific disaster can truly be identified. In many instances, such as the three examples of cascading disasters given above, a specific hazard delineated in space and time can be pinpointed as the start of when vulnerabilities were identified and when the potential for disaster became evident. But vulnerability as a long-term process embedded within societal norms means that each disaster was caused long before a specific hazard manifested. It also means that each disaster has multiple causes.

Taking an example away from the cascading disasters literature, the 12 January 2010 earthquake in Haiti illustrates this situation, based on Schuller and Morales [59] and Mika [49]. Prior to 1804, Haiti was a French colony, exploited by the European power as its pearl in the Caribbean for sugar cane, coffee, and tobacco planted and harvested by slaves. Haitian slaves rebelled in 1791, winning the war in 1803 and declaring independence on 1 January 1804 as the first free Caribbean country after Europeans arrived.

Colonial powers were upset by this freedom, with France demanding reparations which were eventually paid off in 1947 and the US continually controlling Haitian politics. The behaviour of the US and France was ironic considering that both countries had, within living memory, succeeded in their own revolutions for achieving their own freedom. Moving into the twentieth century, American marines invaded Haiti in 1914 to take Haiti's foreign cash reserves to New York and then occupied the country from 1915 to 1934. Two brutal dictators, François (Papa Doc) Duvalier from 1957 to 1971 and afterwards his son Jean-Claude (Baby Doc) Duvalier, pillaged their country with on-again-off-again support from France and the US. The Haitians rose up in 1986, forcing Baby Doc to flee to and settle in France, leading to a series of Haitian elections and coups, frequently controlled or influenced by the US.

In 2004, the UN took over the country and was in the midst of reconstructing Haiti for true independence and self-governance when the earthquake rumbled. The seismic shaking toppled buildings and triggered landslides, killing over 200,000 people. All consequences of the shaking and of the collapsed buildings are from the primary overall disaster—a disaster of more than two centuries of social and infrastructural neglect. This long-term undermining of Haiti and the creation and perpetuation of vulnerabilities and hence disaster risk was fed by outside powers for their own interests, often with amenable Haitians such as the dictators and their militias. This situation caused the disaster in a complex web of inter-related causalities focused on multilayered, intertwined vulnerabilities.

Apart from vulnerability as an overarching, embracing concept, it is challenging to argue for a single cause which can be identified as the beginning of the disaster which appeared on 12 January 2010. Any cascades evident on that day—such as fires, fuel spills, and power outages, all of which occurred and which could be framed as cascading disasters—are small compared to the vulnerability cascades of the previous years dating back to 1804 (or 1791 or 1492) which were the causes of the 2010 earthquake disaster.

Cascading disasters theory has started along this pathway [56] to fully embrace this articulation of vulnerabilities as the root and real cause of disasters rather than starting with the manifestation of a specific hazard. Pescaroli and Alexander [56] explicitly reject the "toppling domino" analogy, plus the original definition states that "Cascading disasters tend to highlight unresolved vulnerabilities in human society". The baseline, though, is that disaster research's history [26,28,3,44,9] explicates how all disasters highlight the problem of vulnerabilities which, by definition, need to be resolved, hence a cascading framing provides nothing new in this regard.

### 2.3. Cause to effect

A second critique of cascading disasters theory explores the mechanisms of transitioning from causes to effects or to other causes within the chain presented as being a disaster. Through "Normal Accidents" theory, Perrow [53,54] laid out and refined difficulties in developing and analysing such a chain. He suggested two properties for technology and infrastructure affected by a disaster.

The first property is complexity referring to the number of components within a system and the ability to analyse those components. The second property is coupling referring to the connectivity amongst components and how fast changes propagate amongst different components. Higher complexity yields increasing problems of understanding possible failures within the system. Tighter coupling yields increasing problems of rapid failures of components. Where many system components have the possibility of failing simultaneously or in