Natural hazard events and national risk reduction measures unconnected

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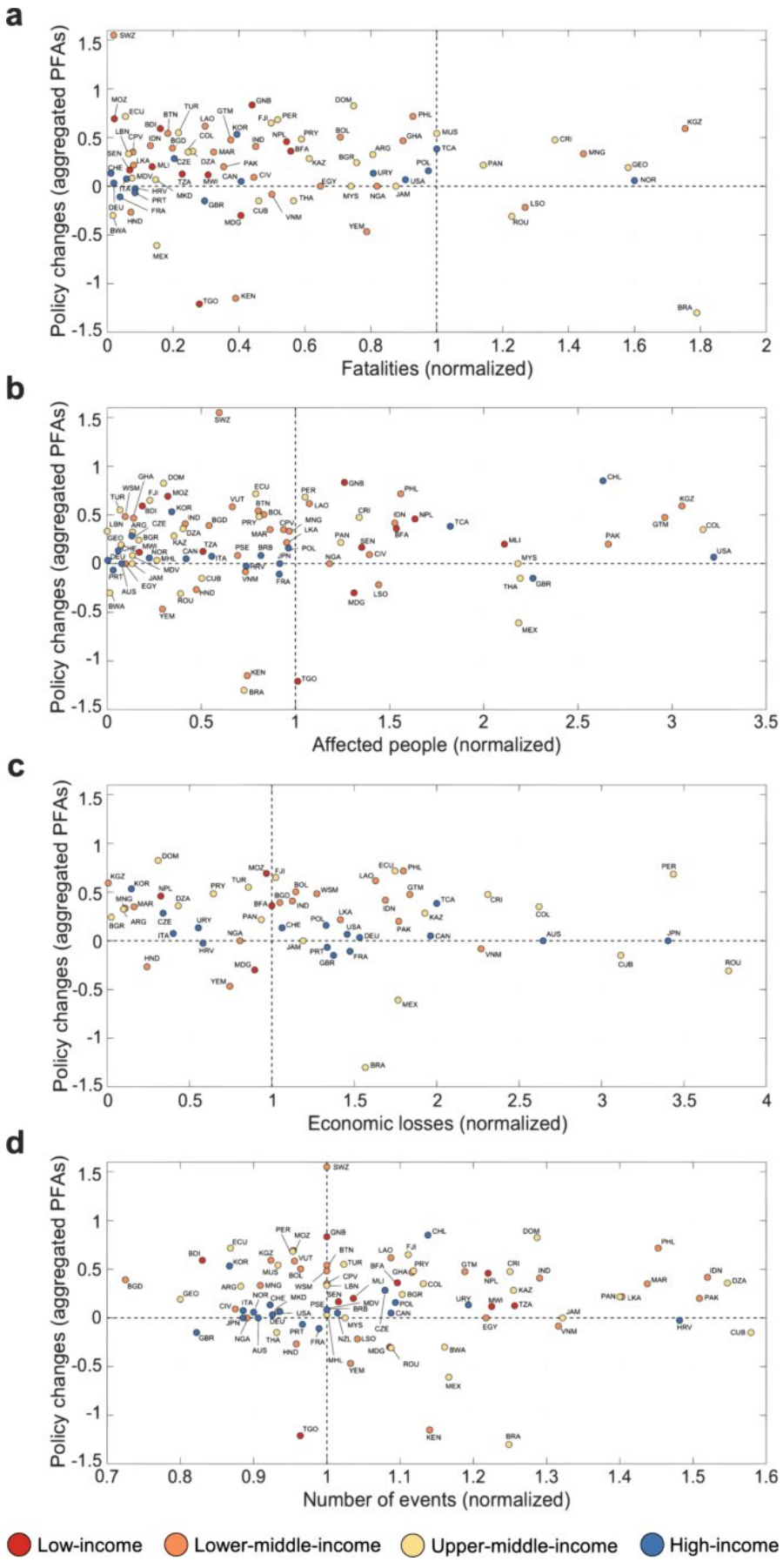
a
Policy changes (aggregated PFAs)
Fatalities (normalized)
b
Policy changes (aggregated PFAs)
Affected people (normalized)
c
Policy changes (aggregated PFAs)
Economic losses (normalized)
d
Policy changes (aggregated PFAs)
Number of events (normalized)
Low-income
Lower-middle-income
Upper-middle-income
High-income

Plots demonstrating the relationship between fatalities (a), affected people (b), economic loss (c), number of events (d), and average changes in aggregated HFA PFAs by income levels in the World Bank's fiscal year 2015 (red = low income; orange = lower–middle income; yellow = upper–middle income; blue = high income). Country acronyms are provided in the Source Data file. Frequency and severity measures are normalized against the 30-year country baseline. Normalized index ≤1 indicates that hazards are less or equally frequent and severe as the 30-year baseline long-term average. Conversely, normalized index values >1 represent more frequent and severe events than the 30-year baseline. Frequency and severity scales have been shortened for readability, to the effect that some countries are excluded from a–d. Countries not shown in a: Chile (CHL, normalized fatality score = 2.54), Australia (AUS, 2.94), Japan (JPN, 3.27), and Samoa (WSM, 4.13); b: Uruguay (URY, normalized affected people score = 6.26) and Macedonia (MKD, 4.90); c: Chile (CHL, normalized economic loss score = 5.47), New Zealand (NZL, 7.68), Thailand (THA, 8.06), and Malaysia (MYS, 5.18); d: Turks and Caicos Islands (TCA, normalized number of events score = 2.0). Source Data are provided as a Source data file. *Nature Communications* (2021). DOI: 10.1038/s41467-020-20435-2

Countries where massive natural hazard events occur frequently are not more likely than others to make changes to reduce risks from future disasters. This is shown in an interdisciplinary Uppsala University study now published in *Nature Communications*.

Natural hazard events, such as storms, floods, and wildfires, entail huge and growing costs all over the world, but they can also be occasions for countries to implement risk-reducing changes. There is no research consensus on whether natural hazard events lead to policy modifications or, instead, contribute to stability and preservation of existing solutions. Knowledge in this area to date has been based on individual case studies, and global trends have not been studied.

To explore the issue on a larger scale, the researchers at the Centre of Natural Hazards and Disaster Science (CNDS) in Uppsala used copious data material, including the international Emergency Events Database (EM-DAT) and progress indicators from the United Nations Office for Disaster Risk Reduction (UNDRR). This material enabled them to study 10,976 natural hazard events between 1970 and 2011 andthe disaster risk reduction (DRR) measures in 85 countries over eight years Examples of actions examined were legislative changes, emergency preparedness and plans, early-warning systems, and training and information campaigns. The researchers also looked at whether disaster risks had been taken into account in terms of land use, natural resource management, climate change adaptation and other areas.

The study investigated relationships between action taken and the number of disasters a country was stricken by and/or their scope in terms of the number of people affected, deaths, and financial costs. To allow international comparisons, the researchers took into account, for each country whether the number and extent of the hazard events were above or below the national historical average.

The results indicate that no link between countries' exposure to natural disasters and their propensity to take DRR measures appears to exist—regardless of national development levels, how advanced the measures were or what types of natural hazard events occurred.

Although the results suggest that natural hazard events did not generally affect DRR measures in the countries studied, national variation was found. For example, the study shows that countries exposed to equally numerous or extensive disasters reacted differently, with some taking no action at all while others made extensive changes.

Japan and Chile, for example, were both affected by severe earthquakes during the study period. Despite their similar experience, Chile reported

far-reaching changes in its risk assessments and system of mobilizing financial support to boost its disaster preparedness, while Japan reported no changes.

"However, it's important to note here that our study focuses exclusively on disaster risk reduction measures. So it can't be ruled out that disasters triggered changes in other areas. A good example is Japan: the nuclear accident at Fukushima, caused by the 2011 earthquake and tsunami, led to changes in the country's energy policy to reduce dependence on nuclear power," says Daniel Nohrstedt, Professor of Political Science at Uppsala University and the study's first author.

The question of what makes countries' actions diverge remains unanswered. The analysis identifies several countries as particularly interesting for closer investigation to enhance understanding of why some hazard events, but not others, lead to far-reaching changes.

In Nohrstedt's view, the study results challenge the perception of disasters as a key driver of change. Both in public debate and in the research, many people expect destructive disasters to be a wake-up call for decision makers to take action, which is particularly important since several types of these extreme hazard events are expected to increase with climate change. Nevertheless, previous research has shown that disasters often have an aftermath in which issues of accountability, liability and guilt impede learning and change. In other cases—usually in less developed countries—recurring hazard events may require heavy resource inputs to manage acute crises, while issues involving long-term DRR changes receive less attention.

"One factor explaining why certain disasters lead to change while others don't is what happens in the crises that arise after the acute stage, when decision makers and preparedness are called into question. Here, it's important to understand the political aftermath of severe hazard events

and how it can affect prospects for learning and change. Our study also shows that countries' tendencies to implement change don't depend on the level of development or type of disaster that hits them," Nohrstedt says.

More information: Daniel Nohrstedt et al. Exposure to natural hazard events unassociated with policy change for improved disaster risk reduction, *Nature Communications* (2021). DOI: 10.1038/s41467-020-20435-2

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