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# Research brief: The challenges of dynamic vulnerability and how to assess it



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## The challenges of dynamic vulnerability and how to assess it

### Highlights

- We discuss the complex interactions between hazards and vulnerability and suggest methodological approaches to assess and include dynamics of vulnerability in our risk assessments, learning from the compound and multi-hazard, socio-hydrology, and socio-ecological research communities.
- To better understand the complexities of disasters, we need to change our perspective, starting from the circumstances that determine dynamic vulnerability.
- We identify three types of dynamics of vulnerability, namely:
  - the underlying dynamics of vulnerability,
  - changes in vulnerability during long-lasting disasters, and
  - changes in vulnerability during compounding disasters and societal shocks.
- We suggest that, while recognising the challenges of assessing dynamics of vulnerability, we can learn from the methods used in neighbouring fields.

### Recommendations

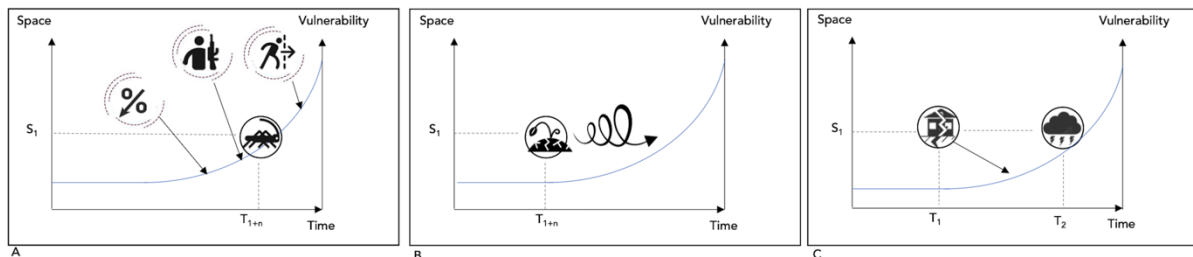
- Growing attention to hazard dynamics in neighbouring research fields has led to the adoption of novel methods, including agent-based models, scenarios, and storylines, as well as qualitative approaches.
- We argue that many of these methods hold significant potential for capturing vulnerability dynamics.
- We categorise these methods into three groups based on their objectives:
  - Qualitative methods, such as narratives approach, which provide insights into underlying processes.
  - Agent-based models (ABMs) and System Dynamics, which can leverage insights from qualitative assessments.
  - Scenarios and storylines, which can build upon findings from ABMs and System Dynamic models to explore plausible future scenarios.

### Context

Since the launch of the Sendai Framework for Disaster Risk Reduction, there has been a notable effort to enhance our comprehension of risk dynamics. In recent times, this drive has spurred increased research within the compound and multi-hazard community, focusing on hazard dynamics. However, a comparatively less explored aspect of risk is that of the dynamics of vulnerability. Around the turn of the century, researchers recognised the intricacies of vulnerability, particularly when transitioning from physical to social perspectives. Subsequent years saw notable developments in vulnerability research, including shifts in indicators, expanding the scope from physical to social vulnerability, and a recent emphasis on dynamic vulnerability. Moreover, distinguishing between social processes as hazards and sources of vulnerability has become increasingly blurred.

We pinpoint three often-overlooked aspects of vulnerability dynamics in risk assessments. These dynamics can extend across vast spatial and temporal scales, posing challenges for both the general public and policymakers in comprehending their intricacies. Integrating these aspects into dynamic risk assessments presents a challenge for researchers. Hence, we explore potential methods drawn from neighbouring fields.

## Illustration/Graph/Picture



**Fig. 1. Three key types of dynamics of vulnerability**

The panels show from left to right: underlying dynamics of vulnerability, such as (internal) migration, conflicts, or economic recession (A); dynamics during long-lasting vulnerability, such as effects of (mal)adaptation, eroding financial resources, or mental well-being (B); and dynamics of vulnerability owing to consecutive or compound disasters, such as the effects of an earlier hazard on the vulnerability at the time of a second hazard (C).

## Want to know more?

- **Full reference:** de Ruiter, M. C., & Van Loon, A. F. (2022). The challenges of dynamic vulnerability and how to assess it. *IScience*, 25(8).
- **Link to paper:** [https://www.cell.com/iscience/pdf/S2589-0042\(22\)00992-0.pdf](https://www.cell.com/iscience/pdf/S2589-0042(22)00992-0.pdf)
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