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Measuring Resilience: A Systematic Meta-Review

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Resilience to natural hazards and climate change is a rather wicked and complex subject, such that it requires the knowledge of several disciplines such as economics, governance, engineering, sociology, and environmental science. The intertwining of these different disciplines results in a symphony of clashes and harmony, but all of this relies heavily on the foundations of research methods.

With a PRISMA-guided systematic meta-review on the measurement of social, community, disaster, organizational, urban, and infrastructural resilience angles, 708 records of systematic reviews were filtered down to 29 reviews after snowballing through articles. Through social-computational analysis, our meta-review focuses on three key questions:

- How are the different resilience reviews related?
- What are the most apparent resilience characteristics considered?
- What are some general characteristics of quantitative metrics from different resilience angles?

Through our analysis, several insights could be deduced:

- Through bibliographic coupling, infrastructural resilience reviews are tightly coupled together, and are distinct from the other resilience angles.
- Using text analysis, such as word clouds and hierarchical clustering, definitions of resilience are diverse and vary within and between resilience angles.
- By surveying the indicators used in quantifying resilience, there is a clear disconnect between infrastructural resilience quantification and other angles of resilience. In particular, non-infrastructural resilience measurements tend to focus on the inherent capacity approach of resilience, whereas infrastructure resilience tends to capture both inherent resiliency of systems and the performance approach of resilience.

Lastly, we have found that infrastructural resilience measurements tend to fixate on the technical domain it is in, whereas urban resilience measurements tend to take a more comprehensive approach encompassing several disciplines. This distinction highlights the need for a comprehensive and integrated approach to measuring resilience. We urge that infrastructural resilience should not solely focus on the functionalities of its systems, but also include the actors, users, and societal dynamics which critical infrastructure systems are embedded in. With the emergence of the System of Systems approach, it is a ripe opportunity to transform beyond disciplinary boundaries and focus on the interdependencies between humans and the built environment.