Measuring flood resilience: the Zurich Flood Resilience Measurement Tool

The Zurich Flood Resilience Measurement Tool is an innovation in community flood resilience theory and practice. Large-scale application in over 70 communities worldwide, with consistent measuring of pre-event characteristics and post-event outcomes, is generating novel empirical evidence about what really makes a community resilient to floods.

Key recommendations

- *Measuring resilience is critical to demonstrate the impact of resilience-enhancing initiatives, but few measurement frameworks exist and hardly any have been validated in the field.*
- *Measurement frameworks need to examine both sources of resilience and outcomes, and consistent measuring over time and over different communities will generate empirical evidence for which sources really make a difference for outcomes across different contexts.*
- *A new tool for measuring community flood resilience has been developed based on a systems approach, incorporating measures of robustness, redundancy, resourcefulness and rapidity across a community's stock of human, social, physical, financial and natural capital.*

Why measure community flood resilience?

To inform future planning and interventions, and demonstrate the impact of resilience-enhancing initiatives, we need to measure resilience[1]. The UN's Development Programme[2] recently reviewed all public documentation about resilience to disasters and concluded that 'no general measurement framework for disaster resilience has been empirically verified yet'. The Zurich Flood Resilience Program partners set out to fill this gap by developing a framework that uses a technology-based data gathering and evaluation tool for measurement and assessment of flood resilience[3]. This tool is being tested and empirically validated.

Our approach to measuring flood resilience

To build flood resilience, we need to know whether a community is and will be resilient when a flood occurs. To do this, we have to measure the sources of resilience, or look for indicators of capacity (or its lack) in the community's socio-economic system, before an event strikes. Our framework broadly builds on the properties of a resilient system developed at MCEER at the University of Buffalo[4], and the Sustainable Livelihoods Approach (SLA) that was adopted by the UK's DFID[5]. This 'systems thinking' approach takes into account the assets and deficits, interactions and interconnections at community level, and provides consistency when it comes to identifying and testing potential sources of resilience.

Across a community's stock of human, social, physical, financial and natural capital we have defined a total of 88 specific sources of resilience. Data can be collected in different ways according to context and need, e.g. household survey, qualitative community

discussion, key informant interviews, and third party sources, and each source is graded A–D by trained NGO staff working with the community. Data collection and grading are done via an integrated mobile and web-based application. To evaluate a community's resilience after an event, the tool measures outcomes to assess impacts such as total losses, and for how long important community functioning such as critical services and livelihood activities are interrupted.

Taking forward the Flood Resilience Measurement Tool

Over time and over different communities, consistent measuring of sources will be tested against post-flood outcomes to see where sources and outcomes are related. Ultimately, we hope to be able to get statistically significant matches between our measure of sources of resilience and outcomes, to empirically explore which sources make the difference for outcomes across different contexts, something that has never been done in this field. For example, by looking at pre-flood sources and flood impacts across multiple communities, we might find that communities that had solid and trusted community leadership tended to have fewer flood mortalities. Or we might find that less socially inclusive communities take longer to repair local infrastructure such as roads (note that these are only hypothetical examples). Results such as these will, in time, lead us to a better understanding of what affects flood outcomes, and how resilience-building investments could be most effectively directed.

Evidence from the field

The tool is being used by Concern Worldwide, IFRC, Mercy Corps, National Academies of Sciences, Plan International and Practical Action in Afghanistan, Haiti, Indonesia, Mexico, Nepal, Peru, Timor-Leste and the USA. In total, it is currently being tested in approximately 70 communities. The organizations are collecting data in their own way, but grading of the 88 sources of resilience is standardized. The digital data collection technology is considered superior in its accuracy and efficiency to traditional paper-based approaches. If and when the community is tested with a flood, the outcomes are also being measured.

As of the start of 2017, all baseline surveys have been collected and are being analysed; post-flood studies are underway as floods occur. Preliminary feedback indicates that the process of training staff and implementing the tool is already producing positive outcomes. In particular, implementing NGOs report that the holistic view of the community system is building local staff capacity to think systemically about their work. For example, in addition to the traditional physical infrastructure, the human and social elements required to make an early warning system operational are being considered in system planning.

References

[1]UNISDR. (2013) *From shared risk to shared value – the business case for disaster risk reduction*. UN Office for Disaster Risk Reduction.

[2]Winderl, T. (2014) *Disaster resilience measurements: stocktaking of ongoing efforts in developing systems for measuring resilience*. UN Development Programme.

[3]Keating, A., et al. (2017) Development and testing of a community flood resilience measurement tool. *Natural Hazards & Earth System Sciences*, 17: 77–101.

[4]Bruneau, M. (2006) Enhancing the resilience of communities against extreme events from an earthquake engineering perspective. *Journal of Security Education* 1: 159–167.

[5]DFID. (1999) *Sustainable livelihoods guidance sheets*, Department of International Development, UK.

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Photo credit: A family home flooded by the Usumacinta river in the Tabasco region, Mexico. Michael Szönyi / Zurich (November 2014).

About the Zurich Flood Resilience Program

An increase in severe flooding around the world has focused greater attention on finding practical ways to address flood risk management. In response, Zurich Insurance Group launched a global flood resilience programme in 2013. The programme aims to advance knowledge and develop robust expertise and design strategies that can be implemented to help communities in developed and developing countries strengthen their resilience to flood risk. https://zurich.com/en/corporate-responsibility/flood-resilience

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